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Notes on Mother Lode Mine in British Columbia

Ore Won by Underhand Stoping; Average Production Eight to Nine Tons per Day per Man Employed; Total Cost below 65 c. per Ton

BY ROY HUTCHINS ALLEN*

The Mother Lode mine of the British Columbia Copper Company is at Deadwood camp, about three miles west of the company's smeltery at Greenwood, with which it is connected by a spur of the Canadian Pacific railway, and seven miles from the mines at Phœnix. With the exception of those of the Granby company this mine is the largest in the Boundary district.

THE MOTHER LODE MINE, PHOENIX, BRITISH COLUMBIA

Geology

The ore occurs as an immense body, or series of bodies, 30 to 200 ft. in width, lying along the contact between a white crystalline limestone on the west and footwall side, and a green fissile epidote material, which may be either altered argillite or greenstone-tuff, on the east. The strike of the orebody is a little east of north, corresponding with the direction of the principal fracture lines of the district, and its dip is to the east at an angle varying from 55 to 70 deg. The ore, according to the members of the Geological Survey of Canada, is a metasomatic replacement of both wall rocks.

The contact with the limestone is sharp, but the line of demarcation from the other wall rock is merely commercial. The ore belongs to the class described by the geologists as the "magnetic" type, and includes the minerals magnetite, chalcopyrite and pyrite, with a very little blende, galena, pyrrhotite, and an occasional trace of arsenopyrite, intermixed with calcite, actinolite, garnet, epidote and quartz. As a whole, there is more magnetite than in the ores of the Phœnix camp.

The most valuable metal is the copper, but the ores will average more than $1 per ton in gold and silver. Tests have shown that the ores with 2 per cent. copper carry the most gold, while those with as high as 30 per cent. copper carry no gold. No limestone is found within the orebody. The ore outcrops for a length of over 2000 ft., and has been proved to a depth of 600 ft. below the highest point of the outcrop. Development work has shown the presence of several nearly horizontal dikes of alkali porphyry running through the orebody, but apparently in no way affecting its continuity.

Plant and Equipment

The mine is opened by a vertical four-compartment shaft, 475 ft. in depth, with drifts at the 60-, 200-, 300- and 400-ft. levels. All ore, from the glory hole as well as from the underground workings, is handled through this shaft. The shaft is well timbered with 10x12-in. timbers, and has two ore-hoisting compartments, each 5x5 ft. in the clear, one cage compartment, 5x5 ft., and one pipe- and ladder-way, 4 ft. 6 in. by 5 ft. in the clear.

The ore is hoisted in four-ton, self-dumping vertical skips from ore pockets at each of the levels, and is dumped into a bin at the headframe. From this bin the

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ore passes through a finger gate, made of heavy rails bent at right angles and operated by a compressed air lift, to a 30x42-in. Blake crusher having corrugated jaw plates of manganese steel. This crusher is driven by a 100-h.p. Canadian General Electric motor taking current at 550 volts, but it may be also be run by a 14x16-in. Erie City slide-valve engine which is held for cases of emergency. The broken ore is taken by a 36-in. belt conveyer up an incline of about 15 deg. to the railroad bins about 150 ft. distant. The discharge from the belt is sampled automatically by a shovel which, revolving about a horizontal axis, cuts out about one-fifteenth of the ore. This sample drops into a bin and is shipped in carload lots to the smeltery, where the final sampling and assaying is done. The bulk of the ore falls into a three-way chute from which any one of the three ore bins may be filled.

The ore skips, which are hung in balance, are handled by a Jenkes Machine Company first-motion hoist, having cylinders 20x42 in., and drums 6 ft. in diameter with a 30-in. face, taking a 1¼-in. hoisting rope. The hoisting speed is about 1000 ft. per minute, and the complete trip from the 400-ft. level is made in 35 seconds. The normal output of the shaft is 100 tons per hour, but this has more than doubled on occasion. The cage which is used for handling men and supplies is served by a James Cooper duplex geared hoist, having 12x14-in. cylinders, and a drum 4 ft. 6 in. in diameter with a 4-ft. face. Both hoisting engines are operated by compressed air at a pressure of from 90 to 100 lb. per sq.in., the air being taken directly from the 7-in. main leading to the compressor house 600 or 800 ft. distant.

The compressor house is beside a small creek and contains, in addition to the compressors, a vertical, triplex single-acting, motor-driven pump which forces the water to the reservoirs 500 ft. higher. There are two air compressors: one an Ingersoll-Sergeant, 30-drill, Corliss compound steam, two-stage air compressor with piston intake, the other a Canadian Rand 40-drill, duplex, tandem two-stage air compressor. The first machine is now driven by a rope drive from a 500-h.p. Westinghouse alternating-current motor making 247 r.p.m. at full load, and taking current at 2000 volts. The compressor has a rated capacity of 2800 cu.ft. of free air per min., compressing to 100 lb. per sq.in., but is being operated at only two-thirds its capacity.

The Rand compressor has two sets of air cylinders, 16 and 25x36 in., with rotary intake and poppet discharge valves. The machine is provided with an automatic cutout which acts successively on each of the eight intake valves, a variation of 3 lb. in the air pressure being sufficient to close or open all of the valves. This compressor is driven by a rope drive from a 600-h.p. Canadian General Electric slow-speed motor receiving alternating current at 2050 volts, and has a rated capacity of 3400 cu.ft. of free air per min., compressing to 100 lb. Power is furnished by the West Kootenay Light and Power Company from its plant at Bonnington falls, and is delivered to the mine at 2050 volts.

Mining Methods

On each level two drifts are run, 7x8 ft. to 10x8 ft. in the clear, one along the footwall, the other 25 to 30 ft. from the hanging-wall and parallel to it. Where the orebody is of sufficient width, as is usually the case, a third drift is run midway between the two. These are connected by diagonal drifts and crosscuts. At intervals varying from 40 to 60 ft. raises are put up on the incline, frequently being driven so as to connect with those

GLORY HOLE, MOTHER LODE MINE

of the parallel drifts on the same level. An 18-hole round is used, the holes being drilled 6 to 7 ft. deep in vertical rows of three each, the resulting raise varying from 8x12 ft. to 10x20 ft. in cross-section. If necessary, other holes are drilled in the roof to obtain the desired hight. A 3¼-in. Sullivan drill is employed, mounted on a 7-ft. column.

When the raise has been advanced about 50 ft., the direction of inclination is often reversed, and as it approaches the level above it is flattened and brought around on the hanging-wall side in the form of a drift or chamber at the top of the raise. The ore on the hanging-wall side is then drilled with machines set on tripods and blasted, after which the ore on the footwall is broken down in benches. In some places the raises are nearly vertical, in others they are of corkscrew shape. In any case, the stoping begins at the top and is carried down by underhand work. Pillars are left throughout the mine, both longitudinally between the drifts, and transversely from wall to wall.

The early method of stoping was to take the ore out in rooms, 30 to 40 ft. square and 20 to 25 ft. in hight, leaving vertical pillars between, but this was awkward and expensive, and was not long practised. In the present method of underhand work drill steel 16 ft. in length is used both in the glory hole and in the stopes, and many holes are drilled before any are blasted. The holes are fired simultaneously and the result is a large tonnage per hole drilled. A blast of 85 holes in the stopes in one case yielded over 8000 tons of broken ore. For blasting, 40 and 50 per cent. dynamite, Hercules brand, is used, while 60 per cent. dynamite is used for bulldozing. Sullivan machines are used for both development work and stoping, and drill from 12 to 40 ft. of holes per shift, according to the nature of the rock. A few 2½-in. Rand "sluggers" are used in raising.

As the glory hole is extended, raises are put up to it from the 60-ft. level at such an angle that the ore will slide readily. The ore here frequently breaks in large blocks and these have to be bulldozed, either on the surface or in the chute. Where the blocks will pass the chute openings, which are 36x48 in., but are too large for the skips, they are removed from the cars near the shaft with a chain tackle and run by an overhead trolley to the adjoining chamber of an old stope, where short holes (5 to 6 in. deep) are put in with a Murphy drill and blasted. By this method a half stick of dynamite will break a rock which would require four or five sticks by bulldozing. The broken rock is thrown into the ore pocket at the shaft.

The ore cars on this level are scoop-shaped, end-dumping, and hold 2½ tons. These are drawn in trains of three or four by horses. At the shaft the loaded cars are run by hand on an automatic dumping arrangement, whereby the car is dumped through the shock of the car and weight of the ore and is returned empty to its original position by means of counterweights. Two men are required to handle the cars.

The ore drops into the shaft ore pockets, the gates of which are about 45 ft. below. These gates are of the finger type similar to those in use at the Granby mines, but differ slightly in the method of action. The four double fingers are pivoted on a rod at the front of the chute and are raised by chains attached to the cross-bar of the piston of the air lift. On the inside of the shaft timbers, at the mouth of the chute, is a large sheet-iron gate to catch the fine material which will pass between the fingers when the gate is closed. The sheet-iron gate is balanced by a weight and is raised and lowered by hand. This gate binds badly when there is a large amount of fines in the ore, and two men are required in loading the skip, whereas with the Granby type but one man is needed.

On the other working levels, viz., the 200-, 300- and 400-ft. levels, the mine cars are side-dumping and have a V-shaped

bottom. These also hold 2½ tons, but are drawn by horses in trains of only two cars each. The loaded cars are drawn on a bridge spanning the ore pockets and there dumped by hand, while the horse returns along a shelf or drift cut at the side of the ore pocket for a passageway. The pockets are provided with gates similar to those on the 60-ft. level.

The ore chutes throughout the mine are strongly made, being built to withstand much hard usage. The posts are stulls, 10 to 20 in. in diameter and up to 20 ft. in hight. Behind these are laid pieces of heavy lagging until the desired hight of the bottom of the chute is reached, usually about 6 ft. above the level of the rails. On top of this lagging is placed a false set which forms the opening of the chute. Dividers are also placed between the front stulls, or posts, at the top and bottom of the chute opening. The planks of the chute are spiked to the lagging and to the lower divider. The chute opening is 48 in. wide and approximately 3 ft. high, and is

A GROUP OF COMPANY HOUSES AT THE MOTHER LODE MINE

closed with the ordinary plank gate made in three sections, the second and third being set successively above and behind the first one. In some of the newer chutes arc gates made of heavy sheet iron are used.

The mine is well lighted throughout by 16-c.p. incandescent lamps, placed every 35 ft. along the drifts and crosscuts. The mine employs a total of about 185 men, most of whom live near by in houses owned by the company. There are a large number of four-room houses for the married men, while a good boarding house is maintained for those unmarried. The output depends upon the requirements at the smeltery, and varies from 1000 to 1600 tons per day. The output per man employed has averaged from 8½ to 9 tons per day for months at a time, with a total cost stated not to exceed 65c. per ton for the ore delivered in the railroad cars at the mine—surely an enviable record. About 60 tons of ore are broken daily for each drill used in stoping.

Work of the Geological Survey in Alaska

The gold output from Alaska for 1909 is estimated by Alfred H. Brooks, geologist in charge of the Alaska work of the U. S. Geological Survey, at between nineteen and twenty million dollars. The production of the Nome placers has been curtailed by dry weather and other unfavorable conditions, but most of the other camps have either maintained or increased their output. The copper production will exceed 4,000,000 pounds.

The field work of the survey this season in Alaska was carried on by thirteen parties. Districts containing both quartz- and placer-gold deposits, silver, copper and coal were explored and surveyed. An investigation was also made of the water resources of the Territory.

In view of the recognized importance of Alaska's bituminous-coal deposits a detailed survey has been made of the Matanuska coalfield. The resulting map will be used as a base for delineating the coal-bearing strata, and by the time this important field is reached by the Alaska Central railway, of which over 70 miles have already been completed, detailed information regarding the distribution and magnitude of the coal deposits will be available. This railway will also afford access to the Willow creek district, where some quartz veins, rich in gold, were opened up last year.

Railroad construction is also being energetically pushed on the Copper River railway. Trains are running on 75 miles of this road and probably 25 miles more will be completed this autumn. The road will connect the copper deposits of the Chitina with tidewater on Prince William sound. Detailed geologic mapping of the best developed portion of this copper district has been completed.

New Fairbanks District Promising

A preliminary study of the newly discovered lode deposits of gold at Fairbanks was made. Although no large orebodies have been found here, some of the veins are rich and appear to be persistent. Pyrite, arsenopyrite, stibnite, sphalerite, galena and free gold are found in a gangue of quartz. Prospectors report the occurrence of telluride ores, but specimens tested in the survey's laboratory show no evidence of tellurium. The development work is chiefly surface prospecting, but some deposits have been followed to a depth of nearly 100 feet.

Two important pieces of exploratory work were accomplished, one in the region west of Cook inlet and one over an area between the lower Yukon and Seward peninsula. The two largest lakes in Alaska have been surveyed, Lake Iliamna, about 100 miles long, and Lake Clark, a narrow lake about 50 miles in length. Copper- and gold-bearing quartz and a little placer gold have been found in this region, but they have been but little developed. Exploratory surveys in the country lying between the Yukon and Norton bay show that the region extending eastward from longitude 161 deg. holds out but little promise of containing valuable mineral deposits. To the west of this line, however, there are metamorphic rocks which may be auriferous. Geologic work was done by one party in the gold and copper regions of the eastern Kenai peninsula and important information obtained concerning its geology, geography and mineral deposits.

Water Power Investigated

Measurements of stream flow, in order to determine the quantity of water available for placer mining during the open season, were continued this year by the survey engineers in the Fairbanks, Birch Creek, Hot Springs and Rampart districts, and also in the Seward peninsula.

Water powers also play an important part in the mining industry of southeastern Alaska, since their utilization will permit the mining of low-grade ores which cannot be commercially exploited by the use of coal for power. For this reason an engineer of the water resources branch of the survey visited this field in order to familiarize himself with the water problems involved and to obtain a basis on which to plan systematic work.

Another party spent the summer in carrying reconnaissance surveys from the Yukon to the Koyukuk and thence to the Chandalar. The annual gold production of the Koyukuk among the Yukon camps is exceeded only by that of Fairbanks.

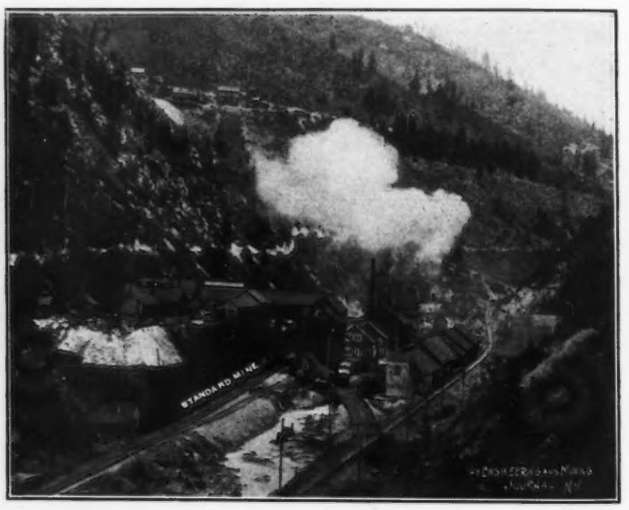
In accordance with the practice of making detailed surveys of the important mining districts, the geologic mapping and study of the ore deposits of the Berners bay district was completed this summer. This district, though dormant at present, possesses some valuable lode quartz deposits. These surveys were also carried southward to the Eagle river district.

Ore Dressing in the Coeur d'Alene District—II

Intelligent Ore Sorting a Valuable Aid in Milling; Few Mills Designed by Engineers; Disadvantages of Steep Millsites

BY EDWARD S. WIARD*

Those mines which are some distance away from the mills, as notably the Last Chance and the Standard-Mammoth, have large storage bins at the mines in addition to those at the mills. The ore of the Standard-Mammoth mine at Mace is transported to the mills about six miles below in Canyon creek on the standard-gage tracks of the Oregon Railroad and Navigation Company and Northern Pacific Company. The ore of the Last Chance mine is hauled a distance of five miles from the mines at Wardner to the mill two miles west of the town of Kellogg on the main line of the Tekoa-Wallace branch. The Bunker Hill & Sullivan and the Standard-Mammoth mines are equipped with electric motors to haul the ore from the stopes to the storage bins. The storage bins of the Bunker Hill mine are in the rock house near the portal of the main working tunnel, the rock house being connected with the mill building by an inclined conveyer belt. The cost of transporting ore from the stopes to the mills of the properties mentioned is 2½ to 5c. per ton per mile. At the Hercules the ore is trammed from the portal of the tunnel to a point above the mill, whence there is a gravity tram to the mill bin.



HELENA-FRISCO AND STANDARD MINES—COEUR D' ALENE DISTRICT, IDAHO

Ore Sorting

The ore of nearly all the mines in the district is so pure and occurs in such large masses that sorting can profitably be resorted to. In the Last Chance mine sorting is employed in the stopes and over the storage bins at the portal of the main haulage tunnel. At the latter place the bins are equipped with inclined grizzlies with wide spacings, and after the ore is sprayed the larger pieces of galena are removed. The average grade of the ore sorted in the stopes and over the bins for a period of about two years was approximately 50 per cent. lead and 22½ oz. silver.

Sorting in the stopes also prevails at the Bunker Hill, Hercules and Standard-Mammoth mines. The rock house of the first company is arranged for sorting, the oversize from four grizzlies with 1¼-in. spacing passing to a flange-sided picking belt. This belt is merely a conveying belt at present, sorting not being attempted owing possibly to the crowded condition of the belt from the heavy tonnages being put through the plant. I am of the opinion that the operation of sorting would not be a success here as no feeder is provided to control rushes of ore, and the need of spraying is not recognized. For the year ending May 31, 1907, the Bunker Hill Company shipped crude ore obtained by sorting which averaged approximately 40 per cent. lead and 17 oz. silver.

All the mill ore which comes from the mines of the district is wet and slime coated so that it is impossible to distinguish galena from waste. Freshly broken in the stopes the larger pieces of galena can be readily seen and removed, but in the dim light of a candle the bulk of the smaller rich pieces must inevitably be overlooked. There is thus a field in the Coeur d'Alene mines for sorting underground and in daylight when the ore is properly spread out. In Mexico and other arid regions where the ground-water level is deep, the milling ore is often bone dry and it does not become coated over in handling. It is possible to sort such ore without spraying, as the small amount of adhering dust does not hide the galena.

Crushing Reduces Galena to Fines.

The ease with which galena reduces to impalpable fines in crushing operations, to say nothing of other operations in the mill which tend to make fines and slime, is perhaps not thoroughly appreciated. I will cite two instances from my own experience. In the first mill the ore, after being crushed by a McCully crusher to pieces of a maximum size of 3 to 4 in., was delivered directly to a conveyer belt.

It was the original intent to sort on this belt, but owing to its being too narrow and no feeder having been provided to take care of the rushes of ore from the crusher, the idea had to be abandoned. It will also be noted that the fines were not eliminated. In the ore on the belt could be seen many pieces of nearly pure galena.

The belt discharged its load into Blake crushers which reduced it to a maximum size of 1¼ in. It then passed to trommels with ¾-in. and 6-mm. round openings. The oversizes of the trommels were fed to rolls. After crushing, the product from the rolls was returned to the trom-

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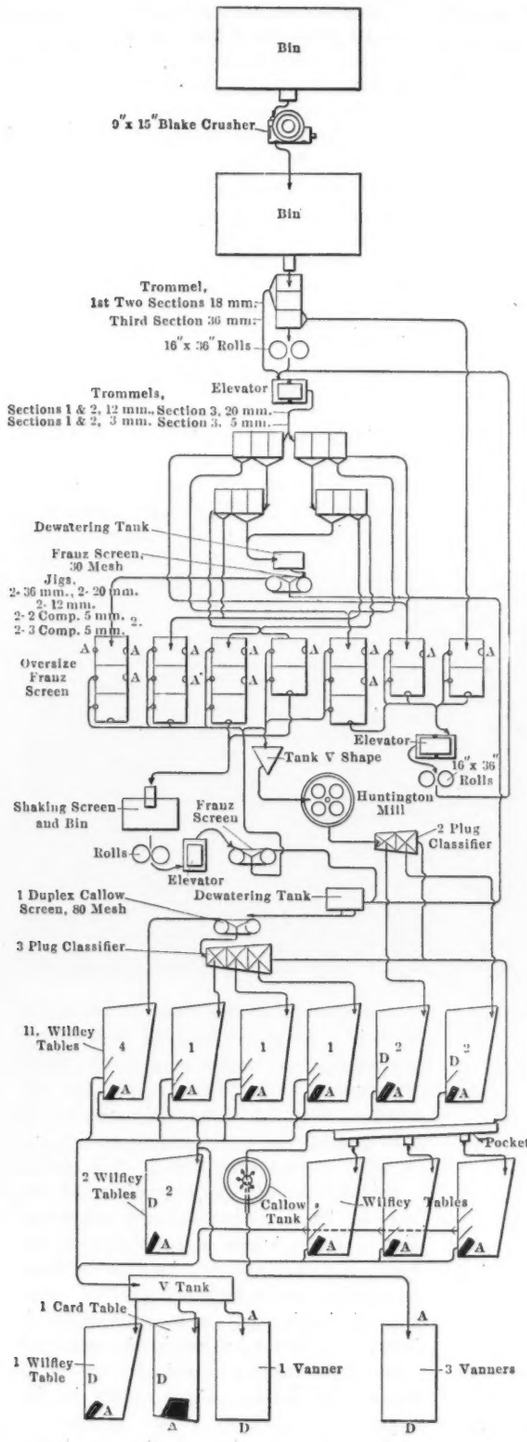
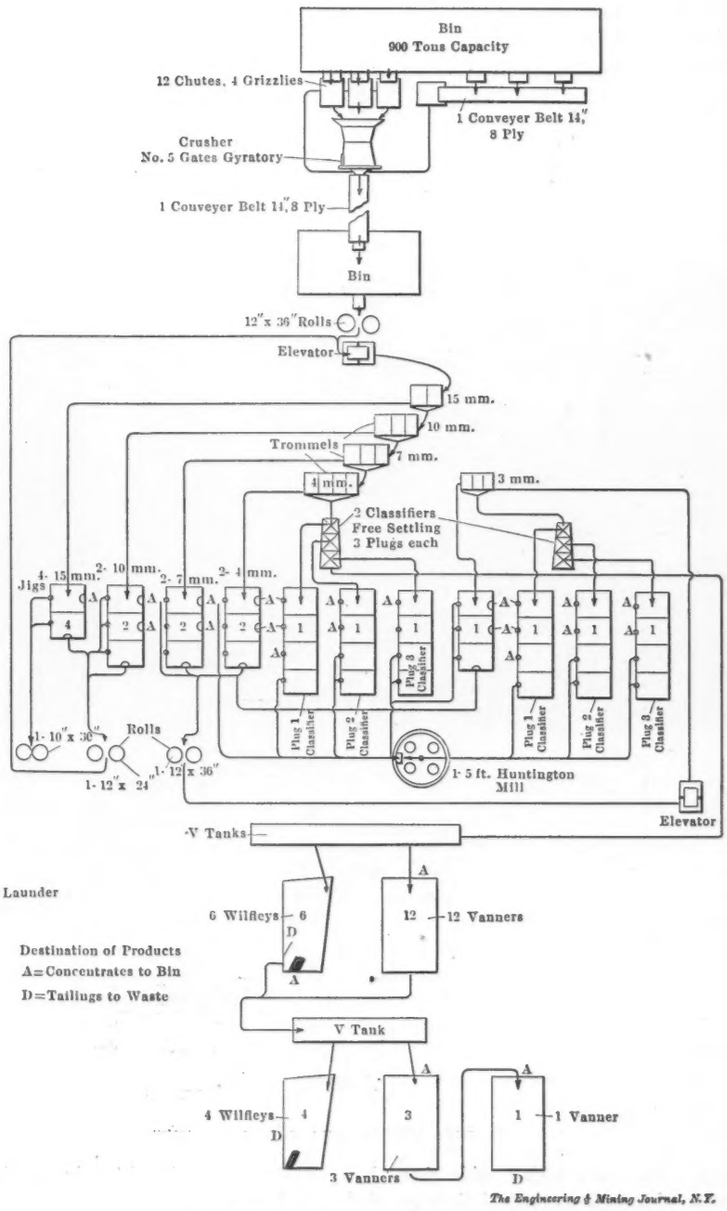
mels and the ore thus crushed to a limiting size of 6 mm. A cursory examination of the material from the 6-mm. trommel in the spout over the rolls failed to disclose a single piece of clean galena, but a sizing test showed relatively large amounts of fine galena.

The second instance is the extreme one of a stamp mill crushing gold ore containing galena of a maximum size of 2 in. through a 24-mesh battery screen. The stamped product was found by careful test to contain over 96 per cent. of galena which would pass a 200-mesh screen. The ore as fed to the stamp battery contained 2 per cent. galena which would pass a 200-mesh screen. To successfully sort ore in a surface plant in the Coeur d'Alene district, the following points must be observed: The fines must be eliminated; the ore must be uniformly fed on the sorting belt; the belt must be sufficiently wide to allow of a thorough spreading out of the ore; the ore must be sprayed. That sorting can be highly successful in intelligently designed plants, the following description of the Hecla plant will show.



FLOW SHEET OF HERCULES MILL



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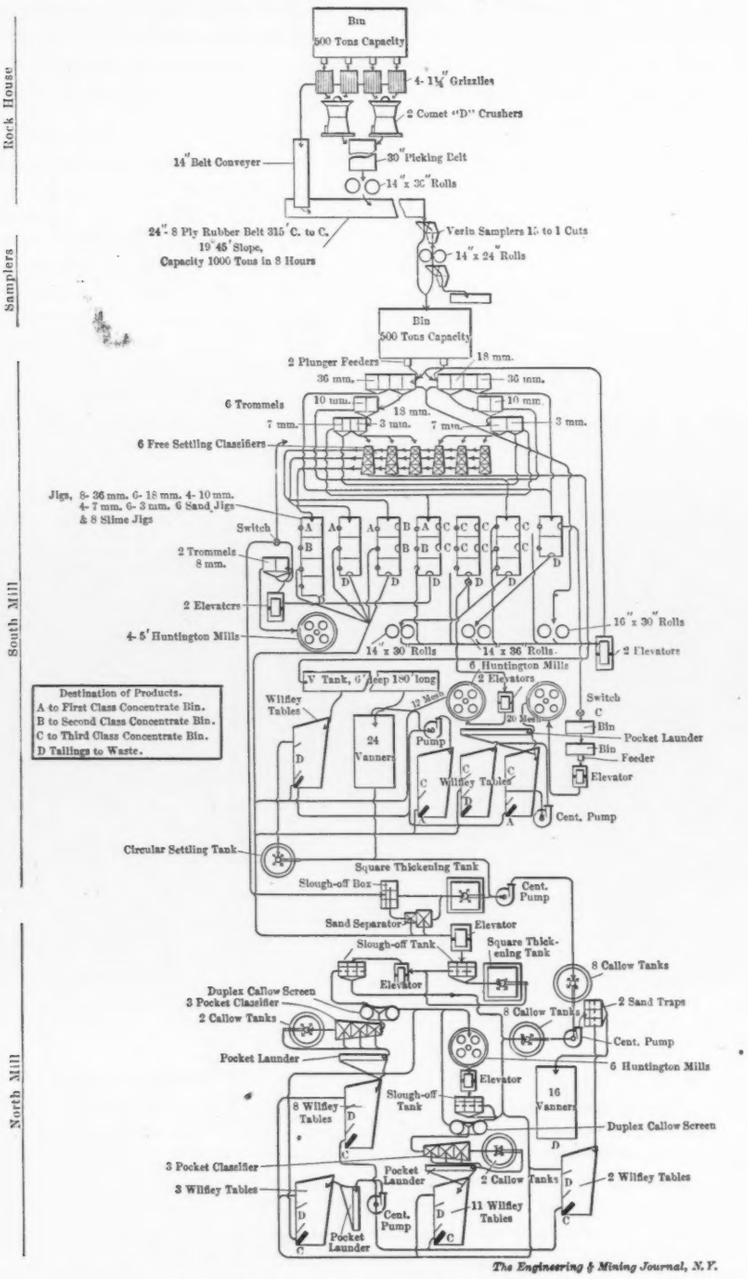
FLOW SHEET OF FEDERAL'S MAMMOTH MILL

EQUIPMENT FOR SORTING AT HECLA PLANT.

The ore is hoisted 62 ft. above the collar of the vertical shaft and dumped upon grizzly bars with 3-in. spacings and inclined at an angle of 31 deg. The oversize slides to sheet-steel tilting plates

placed flush with the working floor and hinged at the rear, or grizzly, side. The men work over the plate facing the grizzlies. While sorting, the plate is prevented from dumping by supporting lugs which can be depressed by hand levers placed at a convenient distance on each side of the plates. The cars which are now in use are to be replaced by self-dumping skips. For each tilting table there is a sorter who receives three dollars per shift and who sorts out 6¼ tons of waste and 2¾ tons of first-class shipping ore. The crude ore contains approximately 40 oz. of silver and 40 per cent. lead, and the waste 0.3 oz. silver and 0.3 per cent. lead. Two shifts are employed on the tilting plates.

The ore hoisted per 24 hours amounts to 350 tons. When a car of ore is sorted the plates are dropped, the ore falling into a bin underneath. From this point the oversize ore is trammed to a 9x15 Blake crusher and, after being crushed, passes by a conveyer belt to the railroad storage bin, its destination being the mill some distance below in Canyon creek. The undersize from the 3-in. grizzly drops upon a second grizzly with 1-in. spacing. Both undersize and oversize ore from this grizzly pass into bins beneath, equipped with shaking feeders. Plunger feeders were originally provided, but did not work satisfactorily and the present feeder is merely a shaking pan placed under the sheet-iron hoppers secured to the bottom of the bins.



BUNKER HILL & SULLIVAN FLOW SHEET

The undersize ore is fed to a flat conveyer belt 18 in. wide and with a rate of travel of 150 ft. per minute. This belt discharges upon the conveyer belt below the 9x15-in. crusher mentioned, and thus has the same destination as the rejected material from the tilting tables. The oversize ore from the 1-in. grizzly drops from the feeder upon a flat 30-in. sorting belt with a rate of travel of 15 ft. per minute, and is sprayed near the feeder. Ore and waste are sorted out on this belt, the residue discharging upon the conveyer belt below the 9x15 crusher. Four men are employed on the picking belt per 9-hour shift, and sort out a total amount of 7½ tons of waste and 4½ tons of first-class crude ore. These products carry the same amounts of lead and silver as the similar ones from the tilting table.

Sorting Cheaper Than Concentration.

Approximately 85 per cent. of the ore hoisted goes to the mill, the remainder being waste or crude ore. Seven men work per shift, six sorters and a shift boss and oiler. The results obtained are summarized in an accompanying table

SORTING COSTS AT HECLA PLANT.

	Tons Ore per Man per Shift.	Total Tons per Man per Shift.	Cost per Ton.	Cost per Ton Shipping Ore.
Tilting table:				
Shipping crude..	2¾	9	$0.34	$1.78
Waste.....	6¼		0.34	
Sorting belt:				
Shipping crude..	1.13	2.98	1.06	1.29
Waste.....	1.85		0.60	

in which the costs given include labor, supplies and repairs, but not depreciation, etc. On the same basis the cost of milling in the district is from 25 to 30c. per ton.

Assuming that the ratio of concentration is 7 to 1, the cost of producing a concentrate of 40 per cent. grade would be from $1.75 to $2.10. In the last column of the table I have figured all the cost against the crude ore produced, and it will be thus seen that in this district a shipping product can be made at a lower cost by hand sorting than by concentration. If the losses in concentration are taken into account, the balance in favor of sorting would be much greater. Also the elimination of 40 tons of waste is bound to effect a saving in the wear and tear of the milling machinery, but to an amount, of course, which cannot be figured.

Sizing and sorting of the ore below 1 in. would probably not be profitable. The conception of the plant is due to James F. McCarthy, the manager of the Hecla mine, and the design to J. M. Callow, of Salt Lake. The plant was built only comparatively recently. In imitation of it a similar plant has been installed at the Standard-Mammoth mine.

The methods employed elsewhere have been already stated.

The Mills

The principal mills in the district are the following: Bunker Hill south mill, class A, daily capacity, 1000 tons, erected 1899 to replace a mill destroyed by dynamite; Morning, class A, 950 tons, replaced a mill destroyed by fire; Standard, class A, 600 tons; Mammoth, class B, 450 tons; Last Chance, class B, 450 tons, erected 1901; Hecla, class B, 300 tons; Hercules, class B, 300 tons, erected 1905; Hunter, class B, 150 tons, remodeled 1904; Success, class B, 150 tons, erected 1906.

Those mills designated as class A are practically double mills up to the tanks of V cross-section for distributing sand and slime to the Wilfley tables and vanners. They have two trommel lines, duplicate equipment of classifiers, two No. 1 elevators, and duplicate sets of rolls for crushing the coarser jig middlings and the ore from the roll bin. The class B mills have single trommel lines, etc.

With the exception of the North mill of the Bunker Hill company and its new mill, none of the strictly lead-silver mills have been erected from carefully drawn detailed plans following exhaustive tests of the ore. On account of the large masses of nearly pure galena which occur in nearly all of the mines, it was early appreciated that the bulk of the galena could be removed by jigging. The earliest mills were jig mills pure and simple. In the old Last Chance mill, for example, the equipment comprised a crusher, rolls, trommels, classifiers, jigs and a large double-deck round table for treating the coarser sorts of sand. Later in this mill an additional settling and classifying tank and some Wilfley tables and vanners were added.

The mills have been built and designed by practical millwrights, those coming earliest to the district bringing their experience from other camps. In building a plant for a new mine, mills already in operation were more or less copied and mistakes in designing were left to the foreman to correct. When a new mill was planned to take the place of an old one, the usual procedure has been for the millwright to call into consultation all the millwise" ones about the mine, and, with the aid of their quotas of information, to make the design. Careful detailed designing was not attempted, the mill being constructed by the aid of a few general drawings supplemented by sketches and verbal directions. The crushing machinery, shafting, etc., were furnished by contract. Until very recently all betterments in the mills have been directed toward obtaining an increased saving in the slime department.

Mill Sites Usually on Hill Sides

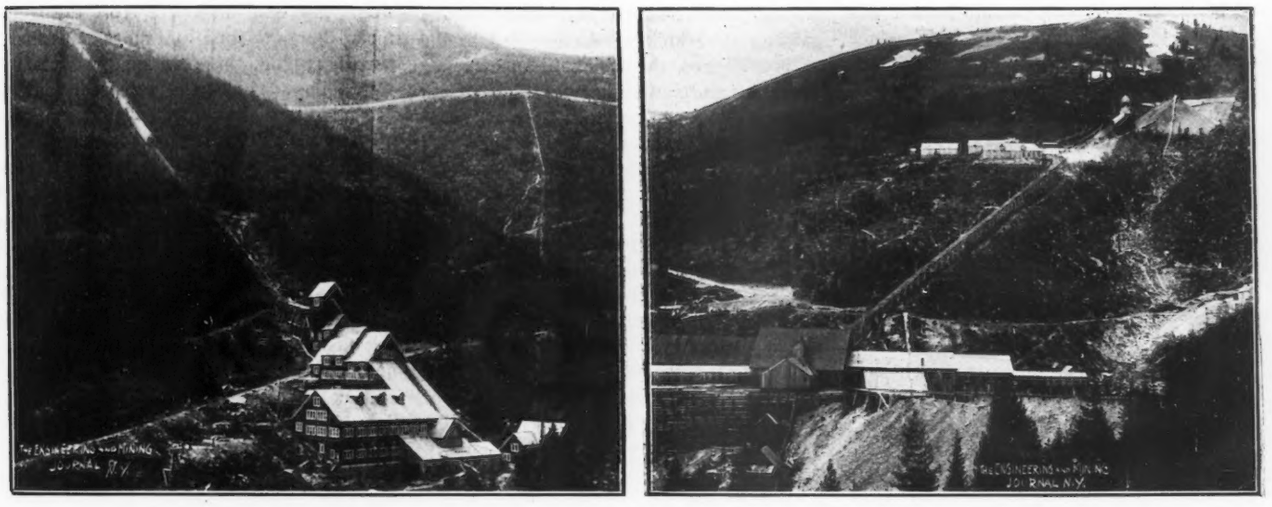
The mills of the district are entirely of timber construction and are situated usually on steeply sloping hill sides. The Bunker Hill mill is on a low, gently sloping bluff of the south fork of the Coeur d'Alene river near the town of Kellogg. The receiving bin is usually at the highest point, the roll bin being in front of it but on a lower terrace. From the roll bin the ore drops into the No. 1 set of rolls, and from this machine drops into the boot of the No. 1 elevator. At the Last Chance mill there is a reserve or storage bin, the ore from which being conveyed to the crusher when needed.

In a number of the mills, as the Mammoth and Morning, one end of the bin is over the crusher, the ore from the chutes at the other end being conveyed to the crusher by a conveyer or cars. As received at the mills the ore has been sufficiently broken to pass into the mouth of 9x15-in. crushers of the Blake pattern, where the first reduction is to 3-in. pieces or smaller. At the Hercules mill the ore after being crushed in a 9x15 crusher drops directly into the roll bin beneath, which is of the same capacity as the receiving bin. The ore is thus reduced in one operation from the usual mine size, which has been mentioned, to a 1¼- to 1½-in. size for roll treatment. This is the usual final limit for crushers in the district.

At the Mammoth mill the ore, after being broken to about 3¼-in. size, is conveyed by a nearly horizontal conveyer to the roll bin. At the adjoining Standard mill the ore is crushed to about 3-in. size in a gyratory crusher, then passes to a grizzly by means of a nearly horizontal conveyer. The oversize from the grizzly is crushed in a smaller gyratory crusher, both undersize and oversize dropping into a roll bin beneath. All the mills mentioned employ grizzlies above the first crusher.

In the Bunker Hill rock house the ore is fed directly from the receiving bin to grizzlies with 1¼-in. spacings, the oversize passing to a gyratory crusher and thence to a set of 14x36-in. rolls. Below the rolls it joins the stream of undersize material from the grizzlies. At the Morning mill the ore from the receiving bin is crushed in a 12x15-in. crusher. It is then conveyed to two gyratory crushers, only one of which is in use at a time. The roll bin is placed under these crushers. At the Last Chance mill two 9x15-in. crushers are employed, only one being in commission at a time. The roll bin below the crusher in this mill is much smaller than those to be found in the other plants. As a rule, roll bins are of sufficient capacity to hold from 12 to 24 hours' supply for the No. 1 rolls.

At the Bunker Hill the ore from the rock house is conveyed on an inclined conveyer to the mill bin. Plunger feeders feed the ore directly into the trommel lines. With this exception, the ore after being broken passes by feeders of vari-



HERCULES MILL AND MINE SHOWING TRAM

ous types to the No. 1 rolls. Sizing out of the fines before the No. 1 rolls is practised only at the Hercules mill. From the rolls the ore passes into the boot of the No. 1 elevator.

Arguments Against Steep Mill Sites

It will be seen from the foregoing descriptions that, with the exception of the Bunker Hill south mill, the ore descends by gravity from the mill or roll bin to the bottom of the No. 1 elevator. The boots of these elevators generally rest on the ground at the base of the hill sides or at the base of the more pronounced sloping portion. Some idea of the hight necessary to raise the ore to put it into the trommel lines will be gained from the following figures of the vertical distances between centers of the head and boot pulleys of the No. 1 elevators in some of the mills: Hercules, 38 ft. 10 in.; Morning, 31 ft. 5½ in.; Mammoth 33 ft. 5¾ in.; Last Chance 48 feet.

In the Last Chance mill, to accommodate the deep jig concentrate bins it was necessary to raise the jig floor which stands over them and the trommel line. Some of the comparatively great hight used to raise the ore to the trommels is expended in giving a high slope to the undersize launders from the trommels to the jigs, the rest being absorbed by adhering to the almost universal plan which prevails in the district of dropping the ore from the bin by gravity to the boot of the No. 1 elevator, and of bringing the coarser jig middling back to one or more sets of rolls set in the same general line at the rear of the mill, and which discharge into the boot of the No. 1 elevator.

I think it must be regarded as a vicious fault that any of the jig middlings are returned to the original trommel line. If this be admitted one of the chief arguments in favor of the hill-side site, viz., fewer elevators, falls to the ground. If the middlings are not to be brought back to the original trommel line they can be kept ahead or down the mill in retreatment. Personally, I favor the gently sloping site to the flat site. In arguments in favor of flat sites too much stress is usually laid on the ease with which a mill can expand and not enough on the fagging-out which comes to hard-working millmen who have to climb from top to bottom of a hill-side mill many times a day, and their inability to see what is going on without doing this.

Returning now to elevators; the gravity site as employed in the Cœur d'Alenes favors fewer elevators but higher ones. With, say, 4-mm. stuff and finer bucket elevators give but little trouble if properly designed, but the troubles increase with the hight. As the material to be raised increases in size the troubles become more and more manifest. With 1-in. sized stuff or thereabouts it would be a more truthful statement to say that the troubles increase as the square of the hight. Flat or gently sloping mill sites exist at various points along the south fork of the Coeur d'Alene river. In the branch streams, such as Canyon, Nine Mile and Milo creeks, the hill sides are precipitous and the mines are contiguous to these canyons. To reach a favorable mill site a more or less long haul would be necessary for all the mines.

Upper Limit of Screening High

At the trommels the first thing which would attract the observer acquainted with the practice in other camps employing wet concentration would be the high upper limit of screening. At the Bunker Hill mill the largest opening in the punched trommel plates is 36 mm.; at the Hercules mill, 36 mm.; at the Mammoth, 15 mm.; at the Morning mill, 22 mm. The oversize from these screens with holes of the maximum diameter goes to rolls. The high upper limit of screening is made possible by the coarseness and purity of the galena. The bulk of the ore fed to the mills is jigged, the weight of ore fed to the tables and vanners amounting to from 10 to 20 tons per 100 tons of ore fed to the mills. However, two-thirds of this amount represents the reground middlings from the jigs. About 95 per cent. of the ore fed to the mills is thus jigged. The percentage of ore treated on tables and vanners is increasing from year to year.

Extraordinarily large tonnages are put through single trommel lines in the mills of the district. In the single-unit mills with but one trommel line, the tonnage from the bin per 24 hours ranges from 150 to 450, and in the double-unit mills, from 300 to 500 tons. In addition there is a heavy return of middlings. Not infrequently the rate of feed to a single trommel line exceeds 700 tons per 24 hours. I shall treat of this matter further in a later chapter; the point to be noticed now is that with the heavy burdens of undersized materials which pass to the jig a large jig equipment is necessary, and to reach the dead boxes of the jigs the trommel line must be raised and the elevators be made higher.

The jig floor below the trommels is usually on the same general level as the rolls for coarse crushing. Not infrequently the bull jigs and some of the jigs treating larger sizes of material from the trommels are on a raised platform overlooking the Nos. 1, 2 and 3 sets of rolls and the No. 1 elevator. These machines are thus set in a form of well formed by the foundations of the mill or roll bin and the platform. At the Bunker Hill south mill the roll bin, which in this case feeds directly into the trommel line, is raised from a flat piece of ground spreading out from the top of a low bluff. The rolls also rest on this terrace. The whole jig floor is raised up on a platform, the bin end of which looks down upon an equipment of six sets of rolls and two No. 1 elevators. As to the jigmen is delegated the duty of caring for the main complement of rolls, the necessity of having them visible from the jig floor is apparent.

At the Last Chance mill the roll equipment is entirely under the jig floor and access to the rolls is had by stairways at each end of the jig floor. The oversize of the first trommel is returned to the head of the trommel line after being crushed in the No. 2 set of rolls. The middlings from about 8-mm. size and coarser also find their way into the boot of the No. 1 elevator after being crushed in the No. 3 set of rolls, a portion of the sandy hutches of the coarse jigs likewise making the same circuit.

Reference to Flow Sheets

For examples of the practice in these respects, reference should be made to the flow sheets which accompany this section. The final undersize from the trommels flows to one or more classifiers, usually 3-plug, these giving products for jigs. The destination and treatment of the middlings from the fine jigs can also be seen. At the Mammoth and Last Chance mills the rolls and Huntington mills for regrinding the finer middlings are situated on the floor immediately beneath the jig floor. In the south mill of the Bunker Hill the battery of Huntingtons is on the solid ground immediately in front of and below the jig floor. On this floor are likewise the tables and vanners of the south mill. Long V cross-section tanks usually receive the overflow from the classifiers and these not infrequently are placed athwart the mill, the slime and sand from the classifier discharging into the side.

At the Hercules mill these long tanks have been replaced by shorter ones, the overflow of which passes to a long launder provided with classifier pockets, and what is not removed in these pockets is thickened in conical tanks and fed to vanners. At the Mammoth mill the first treatment tables and vanners are on a floor ahead of the jig floor and but little below it. Distribution of sand and slime to the tables and vanners is made by two parallel tanks, the overflows of which pass into others on the same general level. Retreatment of the middlings from these tables is accomplished on a floor below the jigs and also by the first-treatment tables and vanners. In the rear of this floor are, as has already been mentioned, rolls and Huntington mills. At the front are the tables and vanners and the bins for jig and slime concentrates.

In the Morning mill the overflows from the classifiers pass into the side of a V tank, and the overflows from this into two others parallel to it. The coarser sands receive treatment on round tables

and the finer sands and slime on tables and vanners. In the settlement and distribution of the middlings from these machines for retreatment, and for retreatments of the vanner tailings, an enormous system of parallel V tanks is employed.

At the Last Chance mill the overflow from the classifiers flows by a launder to tanks above the upper floor of a separate two-story building, retreatment of table and vanner middlings being accomplished on the lower floor. Classifiers are not employed in the Federal mills for producing table and vanner feed. At the Hunter mill there is an elaborate system of classifiers, both for the jigs and Wilfley tables. The final overflows from the classifiers pass into two wall tanks. Retreatment tables are on a floor immediately below, and on this floor are likewise the direct and retreatment vanners. The concentrate bins are usually placed on the lowest floor of the mill. At the Last Chance mill the slime concentrates are settled in a bin on the lower floor of a building separate from the main one, and the jig concentrate bin is immediately below the jig floor. In expansion for slime treatment the relatively narrow main buildings have frequently been built out in long wings at the bottom.

Flow Sheets Typical of the District

Three flow sheets have been selected as typical of the practice of the district. It will be noticed that there are only solid lines to indicate the flow of various classes of material down the mills. If correct average assays could be obtained of the various classes of material circulating through the mills whose flow sheets are presented, and it would be advisable to print them, some clearness might result by inserting the assays on the flow sheet and accompanying them with different sorts of lines to indicate middlings, different grades of concentrates, etc. The ultimate destination of a finished or rejected product is a bin, the dump or the creek. On the flow sheets such destinations are indicated by letters, the meaning of these letters being explained by the text which accompanies the flow sheet, and the destination of material to be treated is thus all represented by solid lines.

On the Bunker Hill sheet three separate buildings are indicated. Of these the south mill is the old or main building. The north building is a recently erected plant some distance away from the south mill on the jig tailings dump. This plant was erected to treat the immense mass of tailings which has accumulated there. At present it is being used to retreat middlings from fine jigs, Wilfley tables and vanners in a way that an inspection of the flow sheet will show. On the completion of the new west mill, the north mill will be put in commission as a tailings plant. The Bunker Hill mill of 1899 is substantially the south mill as it exists today; there was, however, originally an equipment of round tables which have been replaced by Wilfleys. The round tables had three decks and received the sand from the first plugs of the V tank. The middlings from the two upper decks was treated on the lower deck and two products were made, concentrates and middlings. The middlings from the lower deck were retreated on Wilfley tables.

The Hercules flow sheet may be regarded as that of a mill in an unstable condition. This mill[1] has only recently been completed and constant changes are being made in the treatment of sand and slime. The most noticeable features of the mill are the substitution of screens for the usual deep-pocket classifiers, the use of short classifying tanks and classifying launders and the employment of round filter tanks for collecting the slime concentrates. The Mammoth mill is an example of a mill in equilibrium, no important changes in the flow sheet of this mill having been made in recent years.

In addition to the equipment shown on the sheets, the Bunker Hill has a great spread of settling tanks situated outdoors to settle the drainings from the floors and the overflows of the concentrate bins. The Mammoth also has outdoors settling tanks. The Hercules has a pumping system for returning the overflow of the slime concentrate tank to the water distribution tank in the upper part of the mill, and also tanks and pumps for dewatering the coarse-jig tailings, the water being returned to the storage tanks.

[1]Destroyed by fire, Labor Day, 1909.

Metallurgical Improvements on the Rand

Special Correspondence

In reviewing the events of the last financial year of the Simmer & Jack mine, the chairman referred to the progress that had been made in metallurgical work. Improved results had been obtained by the introduction of a cone classifier between the stamps and the ball mills. The cost of dressing plates had been reduced by allowing much longer intervals between dressings than was hitherto customary, and this has been done without reducing amalgamation efficiency. The introduction of sand filters has also proved successful, and under the new system the time available for sand treatment has been increased by 20 per cent. Improvements have been made in the construction of assay furnaces enabling coal to be burnt instead of the more costly coke. A source of loss has been discovered due to the presence of carbonaceous matter in commercial lime, which causes a precipitation of the gold in solution, and steps have been taken to reduce this loss to a minimum.

During the last year the tonnage treated was in excess of that for the preceding year, having been 831,040 tons as against 785,310, and this increase accounts to some extent for a reduction in costs, although the improvements in metallurgical treatment no doubt account for the greater part of this reduction. The treatment costs of 1908 were 4s. 2d., while those of 1909 were 3s. 9d. per ton milled.

Concentrating Tin Ores

At the Rooiberg tin mine in South Africa, the ores from different parts of the mine vary greatly and the present mill was built with the idea of using the results obtained from its operation as data for its gradual change and improvement. Two features of the plant distinguish it from most tin plants: provision has been made for preliminary sorting, and coarse concentration is employed.

The process is briefly described by R. Recknagel in a report to the Rooiberg Minerals Development Company, Ltd., as follows: The ore as it comes from the shaft is reduced by a rock breaker to 1½-in. size, elevated to the highest point of the mill and passed over grizzlies. The undersize drops into the mill bin and the oversize is washed and then sorted on a sorting belt which delivers the sorted ore into the mill bin. From there this ore is fed by mechanical feeders into a 10-stamp mill of 1050 lb. weight per stamp, crushed and discharged through a 100-mesh screen. The battery pulp is elevated to the highest point of the mill by a bucket-belt elevator, unwatered to a certain degree by a Callow tank, and the pulp passes on the Callow screens where the separation of the pulp above and below 400-mesh fineness takes place. The oversize is treated in a three-compartment Hartz jig, and the undersize passes through a classifier which separates the pulp suitable for treatment on Wilfley tables from the slimes. The latter are thickened in four Callow tanks and then treated on Frue vanners. The middlings from the jigs and from the Wilfley tables are reground by a Holman pan, and the reground material joins the general pulp flowing into the classifiers.

Definite data are as yet not at hand, but it is thought possible to improve the results by even coarser crushing than though the 100-mesh screen, and that the jigs may take finer material than the 400-mesh oversize. Only a small amount of slimes is made in the mill. During the last fiscal year 1100 tons of sorted ore were treated for a yield of 75 tons of concentrates averaging 70 per cent. metallic tin. An output of 60 tons per month is expected.

Reflecting the bad situation of the aluminum industry in Europe in 1908, it is reported that the first year of the Societa Italiana per la fabbricazione dell'Aluminio resulted in a loss of 232,704 lire.

The Guanajuato District, Mexico

SPECIAL CORRESPONDENCE

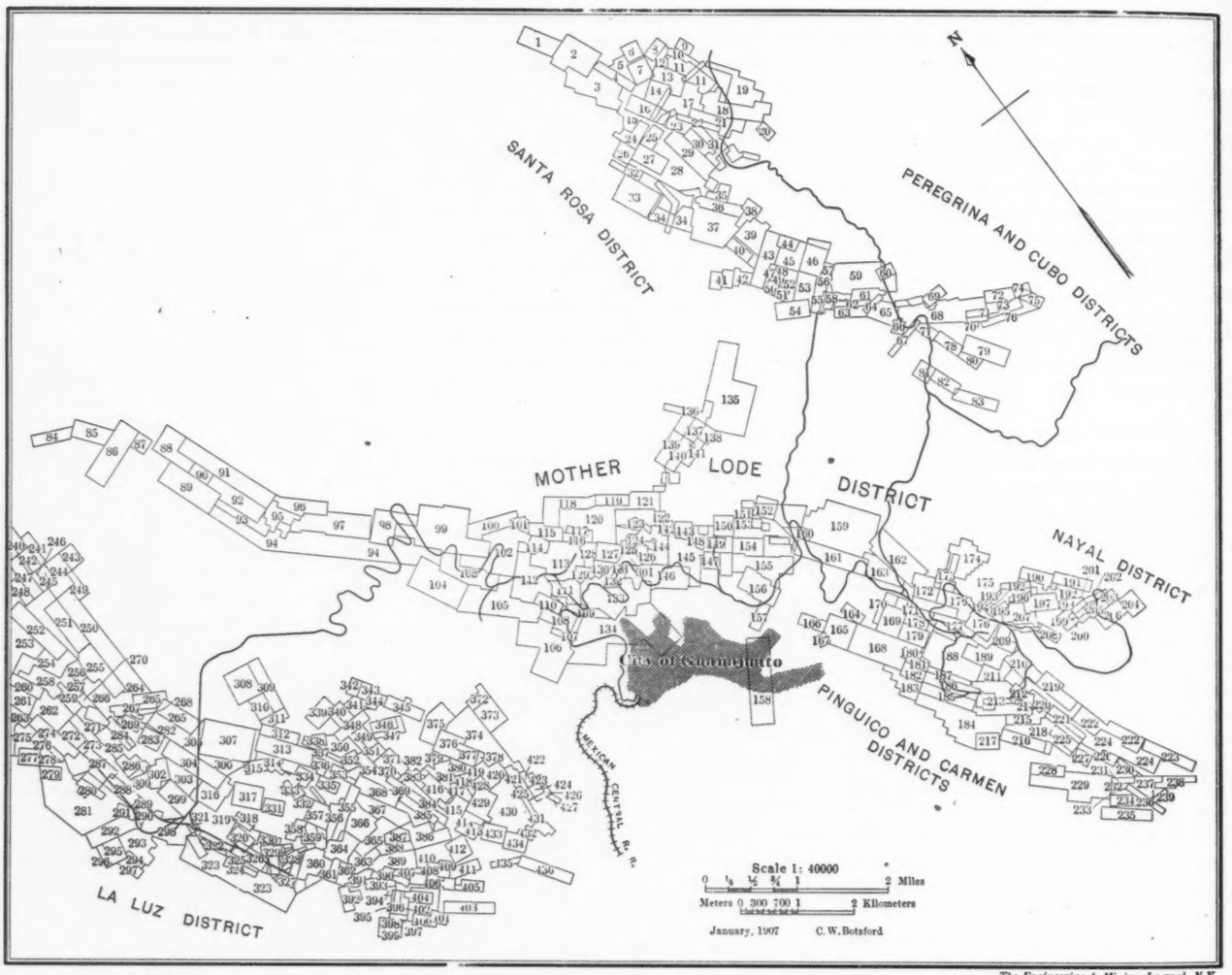
The Guanajuato district in Mexico is one of the best known mining districts in that country. It is particularly well known in the United States on account of the several large mining promotions which have been financed in the United States for this camp. The camp has an interesting history and has a record of enormous production from the earliest time in Mexican mining. The revival commenced with the inauguration of cheap power for the district about 1900 and since that time there has been undertaken in the camp some of the most important mining and milling operations in Mexico. The district, which is quite extensive, comprises the Guanajuato camp proper, and the La Luz section, and several outlying camps. It produced last year over $8,000,000 of gold and silver. The production now is on the basis of nearly $12,000,000 yearly, and it is expected that with the completion of developments and mill installations under way and planned, this annual output will be increased materially.

The camp was extensively exploited by the colonial and early Mexican operators, but with the fall of the price of silver, about 1880, these early operations were nearly at a standstill until the beginning of the new period in the history of the camp. For a time several English companies were interested in the camp, and endeavored to meet the conditions of increasing power costs and decreasing price for silver. These factors, coupled with the unsatisfactory and expensive methods of ore treatment, induced them to leave the field just prior to the American occupancy of the district.

The last revival in the camp was based largely on the assumption of vast reserves of milling ore in the mines and on the dumps, and also with some expectation of finding rich ore which had been left by the Mexican operators. In this last expectation most of the operators were entirely disappointed, but in the matter of ore reserves, the dumps and filling have afforded an enormous tonnage which is today being profitably worked in the mills by cyanidation. The future of the camp depends upon the development of the low-grade orebodies which were not exploited by the early miners, and of the finding at depth of new orebodies of low and high grade. Several companies are sinking deep shafts and driving tunnels to reach the veins in depth and there is a likelihood that the life of the camp will be prolonged for an indefinite period as a result of these explorations.

The camp is supplied with cheap electrical power and now has advantageous railroad connections by a branch line to the Mexican Central. Labor is cheap, and is efficient. The ores are suitable for cyanidation, and the methods largely developed in this camp, in applying this process have so cheapened the costs of treatment that ore which was of no value a few years ago now yields an adequate return on the large investment which is required.

A number of smaller companies are operating on unexplored ground, or in outlying districts, and there is a likelihood that some of these companies will in time become productive and add to the total output of the camp. At the present time



MAP SHOWING MINING CLAIMS OF THE GUANAJUATO DISTRICT

Index to Mining Claims Shown on Map of the Guanajuato District in the Mexican State of That Name

SANTA ROSA DISTRICT.

1—Nueva Florencia.
2—San Gabriel.
3—Negociacion de Sta. Brigida.
4—San Vincente.
5—La Facilidad.
6—La Dificultad.
7—Purisima de San Antonio.
8—La Soledad.
9—San Antonio.
10—San Miguel.
11—San Miguel de San Tomas.
12—Sta. Isabel.
13—Indiana.
14—San Lorenzo.
15—Espana.
16—La Trinidad.
17—El Oriolo.
18—El Refugio la Asuncion.
19—Sta. Fe de Providencia.
20—San Francisco.
21—San Cayetano.
22—San Cayetano.
23—La Conda.
24—San Bruno.
25—San Miguel.
26—La Trinita.
27—El Refugio.
28—La Gallena.
29—La Fortuna.
30—La Conda.
31—San Nicolas.
32—Nueva Mexico.
33—New York.
34—El Durango.
35—La Porfia.
36—La Libertad.
37—San Ignacio.
38—Morelos.

PEREGRINA AND CUBO DISTRICTS.

39—Purisima del Encino.
40—Dolores.
41—Solo Estrella.
42—Buena Vista.
43—Milanesa.
44—Santa Fe del Monte.
45—La Asuncion.
46—S. Juan Tagultapa.
47—Loiseta.
48—Dem. de Pasadena.
49—Pasadena.
50—Nellie K.
51—Espiritu Santo.
52—Gold King.
53—Los Alisos.
54—Meculltepec.
55—La Buena Fe.
56—Los Alisos.
57—San Anton de los Viejos.
58—Guadalupe.
59—La Constancia.
60—La Merced.
61—El Desquite.
62—La Barrecani.
63—Jupiter.
64—Purisima de Caballeros.
65—La Virgen.
66—El Dem. Crato.
67—San Rafael.
68—Peregrina Group.
69—La Fortuna.
70—S. Antonio Cata Diana.
71—La Cumbre.
72—Noche Buena.
73—El Golgota.
74—Patrocinia.
75—Todos Santos.
76—La Purisima.
77—1 Amp. Perseguida.
78—Perseguida.
79—San Antonio (A) La Chirimitera.
80—Las Palomas.
81—El Rescate.
82—Santa Teresa.
83—Santa Rita de Casia.

MOTHER LODE DISTRICT, INCLUDING NAYAL, PINGUICO AND CARMEN DISTRICTS.

84—Lore.
85—Jessie.
86—Copenhagen.
87—Carlos.
88—Cayadonga.
89—Nuevo Porvenir.
90—San Juan Nepomuceno.
91—Socavon de Buena Vista.
92—Restauradora.
93—La Red.
94—El Echado.
95—Socavon de la Aventura.
96—El Broche.
97—Maria y Jose (A) La Piedad.
98—La Porfirista.
99—Esperanza.
100—Protectora.
101—San Bernardo.
102—Victoria.
103—Santa Ana.
104—Sta Fe de Jesus.
105—Maridad.
106—Devonian.
107—La Cruz.
108—San Prospero.
109—La Chueca.
110—San Francisco.
111—Nueva Luz.
112—El Progreso.
113—Negociacion Minera de Valenciana.
114—Esperanza.
115—La Concepcion y Annex.
116—James Burno.
117—La Lucita.
118—Ocho Senores.
119—Las Palmas.
120—Argentita.
121—Colorado Springs.
122—Princess.
123—Nueva Ley.
124—Avis Pero.
125—San Lorenzo.
126—Secho.
127—Marivillas.
128—Tepeyac.
129—Union.
130—Nuestra Senora de Guanajuata.
131—Annex.
132—El Obrero.
133—El Nopal.
134—San Mateo.
135—Superiora.
136—Guadalupe.
137—Pipichagu.
138—Superiora.
139—San Carlos
140—1 Ampliacion de San Carlos.
141—Amp. de Servia.
142—Zapote.
143—El Atalaya y San Vicente.
144—Mellado.
145—Rayas.
146—LaSorpresa.
147—El Maguey y Annex.
148—Pomentorio.
149—Annex.
150—La Aparecida.
151—El Sol.
152—Guadalupe.
153—El Sol.
154—Sirena.
155—Independencia.
156—Paris.
157—Anaconda.
158—El Amparo.
159—Mizpah y San Jorge.
160—Alamita.
161—Mexico.
162—La Concepcion.
163—Isabella Victoria.
164—El Centenario.
165—Ampliacion de San Roberto.
166—Oyama.
167—El Salto.
168—San Roberto.
169—Estrella de Oro.
170—Guanajuato.
171—Pinguico Junction.
172—San Jose.
173—Esperanza.
174—La Fe.
175—Escorpion.
176—El Cedro Group.
177—La Confianza.
178—Golden Queen.
179—La Bufa.
180—Ubaldina.
181—Nueva Carmen.
182—El Engenio.
183—Escondida.
184—El Carmencita.
185—Amp. De El Pinguico.
186—El Pinguico.
187—San Jose.
188—Humboldt.
189—Argentina.
190—Canales.
191—Alfa.
192—Gama.
193—Escondida.
194—Escondida.
195—San Vicente.
196—1 Annex. to San Vicente.
197—Beta.
198—Independencia.
199—La Sorpresa Ofelia.
200—N. O. Alcala.
201—Alcala.
202—Iota.
203—New Nayal.
204—Santa Eduwigio (Nayal)
205—1 Ventura.
206—New Nayal.
207—Annex. to San Vicente.
208—Santa Isabel.
209—Cardones.
210—Fe de Constancia.
211—La Cima.
212—El Varal.
213—El Carmen.
214—Padre Ambrio.
215—Americana.
216—Morelos.
217—Merced.
218—New Pinguico.
219—Constancia.
220—Demasias.
221—El Santo Nino.
222—La Torre Mines.
223—Colorado.
224—Ampliacion del Prestigo.
225—Rosita.
226—El Prestigo.
227—New Pinguico.
228—Monte Cristo.
229—Las Playas.
230—El Pacifico.
231—Roosevelt.
232—Th. Roosevelt.
233—1 Amp. Roosevelt.
234—Gold Bonanza.
235—Los Tusas.
236—Josefina.
237—El Gato Montes.
238—Los Leones.
239—Los Leones.

LA LUZ DISTRICT.

240—San Juan del Jordan.
241—La Constancia.
242—S. Pedro & S. Pablo.
243—Thyself.
244—Tres Marias.
245—Sto. Eduwigis.
246—Morado.
247—Purisima.
248—Sellschop.
249—Cuatro Marias.
250—Cadena de Oro.
251—Susie.
252—Burgos.
253—Sta. Irma.
254—Buena Fe.
255—Keystone.
256—Nueva Purisima.
257—Sevillan.
258—Alianza.
259—E. Sacramento.
260—Feliz Idea.
261—La Chispa.
262—Pennsylvania.
263—San Antonio.
264—Ernestina.
265—Trafalgar.
266—Melladito.
267—San Pedro & San Pablo.
268—La Fe.
269—Sta. Gertrudis.
270—San Fran. de Paula.
271—El Salvador.
272—British Isles.
273—San Felia.
274—La Luz.
275—Thistle.
276—Russel Howland.
277—Cinco Senores.
278—Terreno Libre.
279—Independencia.
280—La Asuncion.
281—San Jorge.
282—Sta. Elena.
283—El Cuervo.
284—Sta. Rita.
285—Peru.
286—La Soledad.
287—San Jose de los Mucnachos.
288—El Refugio.
289—Doctor.
290—Pinidad.
291—Platernos.
292—San Nicolas Tolentino.
293—S. Benito.
294—Amp. S. Benito.
295—Ampliacion De San Nicolas Tolentina.
296—Benito.
297—Benito.
298—La Paz.
299—La Caridad.
300—V. De Dios.
301—Cata.
302—La Porfia.
303—Golconda.
304—La Esperanza.
305—La Cruz.
306—El Carmen.
307—La Soledad de las Carreras.
308—Bonaparte.
309—La Marselias.
310—St. Elena.
311—El Tirol.
312—Ampliacion de Matilde.
313—Matilde.
314—Lepanto.
315—Avis Flores de Oro.
316—San Jorge.
317—La Abundancia.
318—Emma.
319—Loreto.
310—San Francisco de Pili.
321—Sangro de Frisco.
322—Santo Nino.
323—Americana.
324—Palanca.
325—Anne.
326—Purisima.
327—San Miguel.
328—San Pedro.
329—Rosario.
330—Todos Santos.
331—Republicano.
332—Los Reyes.
333—Bethel.
334—Puertecita.
335—San Juan.
336—La Joya.
337—La Perla.
338—G. Felice de Jesus.
339—La Tourraine.
340—Amp. Tourraine.
341—Sampson.
342—David.
343—Solomon.
344—Dalila.
345—Belem.
346—Rabbit's Foot.
347—Rabbit's Foot Annex.
348—Los Reyes.
349—Aurora.
350—S. Angelo.
351—De Aurora.
352—La Bandera.
353—Pabellon.
354—El Jicote.
355—Socavon de S. Julian.
356—Bella Luz.
357—San Jose de la Era.
358—Tres Coronas.
359—Margaritas.
360—Mejiamora.
361—Diamante.
362—S. Carreyano.
363—San Antonia.
364—La Merced.
365—San Miguel.
366—La Loca.
367—Emma.
368—S. Julian.
369—San Jose.
370—Los Yankees.
371—Noche Buena.
372—1 Ampl Buena Ventura.
373—Buena Ventura.
374—Allie E.
375—Ruby G.
376—Harriet M.
377—Singlo XX.
378—Edwin E.
379—1 Amp. Edwin E.
380—Dolores.
381—El Patrosinio de los Reyes.
382—Am Sta. Teresa.
383—S. Nicholas del Joral.
384—La Tlaxpana.
385—Independencia.
386—Socavon de la San Cayetano.
387—San Pascual.
388—Buenos Aires.
389—Buenos Aires.
390—Lourdes.
391—Sta. Monica.
392—Refugio.
393—San Jose de Gracia.
394—La Precascion.
395—San Antonio de los Milagros.
396—Ruby Silver Tunnel.
397—Carter.
398—Walter Scott.
399—El Maguey.
400—Irene A.
401—Purisima del Ocotilla.
402—San Pablo.
403—Riverside.
404—San Diego.
405—El Roi.
406—Guadelupe de Cabrera.
407—Los Dos Ninos.
408—Edwardo VII.
409—La Trinidad.
410—Buena Vista.
411—Waterloo.
412—Humboldt.
413—El Roble.
414—Ampl. Del Roble.
415—La Fortuna.
416—Sta. Teresa.
417—El Porvonia.
418—Reyes Annex.
419—Maria.
420—Zaragoza.
421—Grand Oro.
422—Los Reyes Madas.
423—El Rubi.
424—La Aldana.
425—El Topacio.
426—El Metero.
427—Rubi Ext.
428—Anna E.
429—Eliza.
430—Esperanza M.
431—Margarita.
432—Sta. Maria De Colon.
433—El Peru.
434—Amp. de Sta. MariaDe Colon.
435—Santarder.
436—San Gonzalo.

most of the operations and output are confined to the several large companies which have extensive milling facilities that are operated with great economy and on a large scale.

Practically all of the mining operations now being conducted in the Guanajuato camp are in charge of Americans and are by American companies. The large Mexican holdings have in most cases been transferred, either by purchase, or under contract to these American operators and to all intents and purposes the camp is an American camp. Nearly all of the skilled help is American, but the labor generally is Mexican. There is an increasing tendency to use Mexicans more generally in positions of responsibility in connection with the mines and mills. However, the management and direction of the great enterprises of Guanajuato will probably continue to remain in the hands of Americans.

New Cement Plant in Maryland

Work has been started upon the large cement plant which the Tidewater Portland Cement Company is building at Union Bridge. A spur has been run from the main line of the Western Maryland railroad up to and through the property of the cement company. The first unit of the plant, which will consist of five modern lime kilns, together with a fully equipped hydrating plant, having a capacity of 200,000 bbl. of lime annually, will be ready for operation Feb. 1, 1910. A novel feature of the Tidewater company's operations will be the manufacture of a white portland cement. This will be done from the limestone, which contains barely a trace of iron, and white clay.

The deposits of raw material at this point consist of white limestone, containing between 98 and 99 per cent. of calcium carbonate. The shale deposits lie directly adjacent to the limestone deposits. In fact, the two could be worked in one quarry if necessary. Both materials have been thoroughly tested and pronounced suitable for the manufacture of the highest grade of portland cement. The limestone will also make good burned lime.

The plant is being designed and built by the Fuller Engineering Company, of Allentown, Penn. The kilns will be 8 ft. in diameter and 123 ft. long. The raw material will be dried by the waste heat of the kilns. There will also be an extensive clinker storage, thereby insuring a sound and uniform product. White Portland cement will be manufactured in a separate unit, immediately adjacent to the main unit. The fixed charges and operating expenses in the manufacture of the latter will thereby be reduced to a minimum.

The officers of the company are: President, John K. Tener; vice-president, Joseph T. Fanning; treasurer, Edgar D. Newman; secretary, Owen B. Murphy. It is expected that by the spring of 1911 the cement plant will be in operation.

Early Iron Making in Brazil*

By Orville A. Derby†

The colonial records of Brazil register the fact that about 1590 an exploring party that set out from the town of São Paulo, founded about 40 years before, reported the finding of iron ore in a mountain situated about 100 km. to the southward. Gold and silver were also reported from the same region, and acting on this information the Portuguese government took measures to promote the mining industry in the colony by sending out, in 1597, officials especially charged with this mission. The inclusion of an iron founder in the party indicates a special interest in the discovery of the iron ore, and one or two small forges were set up, which commenced to produce iron probably about the year 1600 and continued in activity to about 1629. The place subsequently took the name of Ipanema, which has ever since been inseparably connected with the long, though not brilliant, history of the iron industry in Brazil. There is a reasonable probability that the iron produced here was the first to be manufactured on the American continent.

Later Iron Making

About 100 years later the rich goldfields of the district of Ouro Preto, the former capital of the state of Minas Geraes, were discovered, and by the year 1700 the rush that ensued was fully established. This opened up to exploration and permanent settlement the most extensive and important of the Brazilian ironfields, that of the Sierra do Espinhoço, or Backbone range, forming the eastern rim of the basin of the São Francisco river. A large part of the gold mines of this and the neighboring district are actually in iron ore which, from the difficulties it presented to the miners, must have necessarily attracted their attention to a marked degree.

There is, however, a reasonable presumption that long before the definite establishment of the iron industry in this region some metal may have been produced by the primitive African methods with which many of the slaves imported in immense numbers for the working of the gold mines must have been familiar. Eschwege states that in 1811 when he arrived in the district most of the smithies then existing produced their own iron, either directly by the spoonful in an ordinary blacksmith's forge, or in a primitive furnace constructed especially for the purpose. Two men who were still living at that time disputed the honor of being the first to introduce the process, which was thus presumed to have been a recent event.

Under the direction of Eschwege a company was formed to erect a direct-process plant in the neighborhood of Ouro Preto, which commenced to produce metal at the end of 1812 at the rate of about 100 lb. per day. The improvements here introduced were eagerly copied, and in a short time the whole mining district of Minas Geraes was dotted with little furnaces. The number of these was estimated in 1864 as 120, many of which are still in operation.

Introduction of Blast Furnaces

In 1765 the production of iron was resumed at Ipanema in São Paulo, but again abandoned after a few years. An attempt made in 1800 to revive the industry, this time by means of a blast furnace, was unsuccessful, and in 1810 a Swedish metallurgist under contract with the government constructed four direct-process furnaces which continued in operation until 1818, when two blast furnaces constructed by the German engineer officer, Frederic von Vernhagen, then in the service of the Portuguese government, were put into operation. These continued in blast under government administration until 1895 with a daily production of three or four tons.

Between 1809 and 1814 an attempt was made to establish a blast furnace at the Morro de Pilar in the neighborhood of Serro do Minas, but the enterprise was abandoned before reaching the productive stage, and until 1888 all the iron produced in Brazil, outside of Ipanema, was made by the direct process. In that year a blast furnace with a daily capacity of four tons, afterward raised to six, was put into blast at Esperança near Itabira do Campo in the state of Minas Geraes, and this has continued to operate successfully until the present, being now the only establishment of its kind in the whole country.

Brazilian Iron Ores

Iron ores of good appearance are known in every state of the Brazilian Union and specimens of them figure in every national exposition, but for the most part definite information regarding the deposits is lacking. The greater part of the specimens exhibited in expositions and museums are magnetites, and of these the majority of those that have been examined have proved to be quite highly titaniferous. A good number of specimens of hematities of excellent aspect, representing numerous widely separated localities, have also appeared.

Limiting ourselves to the districts regarding which definite information is at hand, it may be said that these belong to the states of Minas Geraes, São Paulo, Bahia, Goyaz, Paraná, Santa Catharina, Rio Grande do Sul, and Matto Grosso. The ores known in the first three and the last of these states are predominantly hematites; in others predominantly magnetites.

*Abstract of memorandum prepared for the International Geological Congress, 1910.

†Chief of the Geological Survey of Brazil.

Electric Smelting with the Girod Furnace

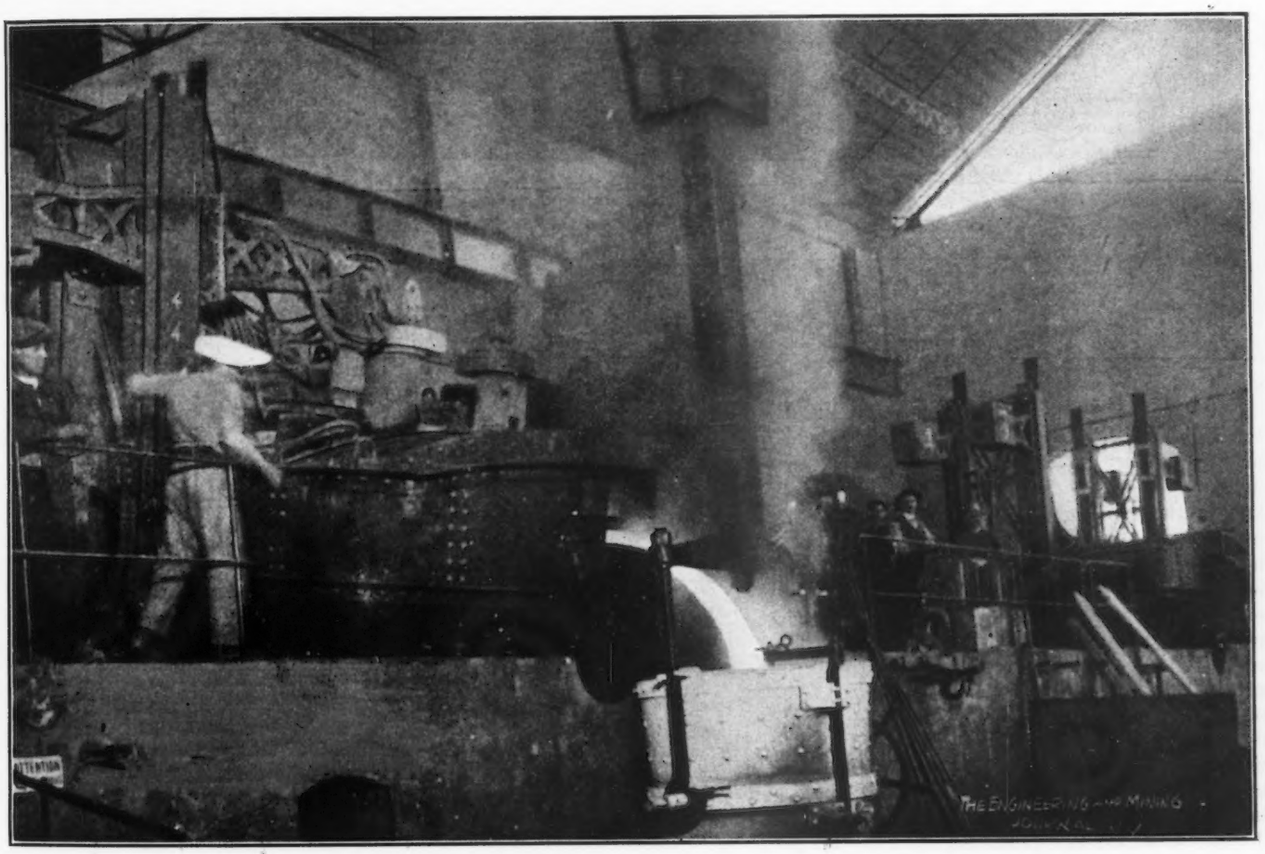
These Furnaces in Successful Operation on a Commercial Scale in a Number of European Steel Works. New Plant for Making Special Steels

BY W. BORCHERS*

In all special branches of the chemical and metallurgical industries in which large electric furnaces became necessary for carrying out new processes or for the improvement of old ones, the development of electric furnaces took place along much the same lines. The endeavors to make a success of a new idea originated many ingenious designs which, almost without exception, proved that the safest and shortest way to practical success is in the utmost simplicity of construction of the necessary apparatus.

Our knowledge of the qualities of materials for building electric furnaces and of the constituents of the furnace charges, especially as to their conductivities at high temperatures, as well as in regard to their chemical affinity toward one another in high degrees of heat is, in spite of all scientific progress, far from being complete; and from that we must deduce that the smaller the number of elements of construction of a furnace the smaller the number of unreliable factors in the construction and running of such furnace.

This natural deduction deserves special attention when an electric furnace for steel making has to be chosen from the constantly growing number of inventions; for the chief constituent of steel, the element iron, is a substance which in its liquid phase has so great an affinity to those elements which are to be removed from the charge, that it is very difficult to comply with the following conditions: (1) To heat the refining slag to the highest point of its chemical activity; (2) to prevent the iron from partaking in these reactions, or, where this cannot be prevented, to make it partake in them in such manner that it finally appears in the end product without material losses; (3) to choose and arrange the materials from which the furnace is to be built so that wherever their contact with the furnace charge cannot be avoided they shall not react upon constituents of the latter in an injurious way.



POURING THE CHARGE FROM 12-TON GIROD FURNACE AT UGINE

The Girod Furnace

When reviewing[1] the electrode furnaces about six years ago, I could say that a furnace simpler than that of Héroult could not be found; today, I have to correct this judgment. For now the Girod furnace must be recognized to be at the head of the list of electrode furnaces in simplicity and safety in construction and running. Though I am far from changing my good opinion of Doctor Héroult's work in electrometallurgy, yet I consider it my duty as professor of electrometallurgy and as an author of electrometallurgical books and other scientific publications, to correct publicly opinions formed during earlier stages of scientific progress which have been superseded by a better knowledge.

After having perceived the advantages of the Girod electric heating system for my laboratory research work, I was accordingly happy to receive and accept several invitations of Director Paul Girod to

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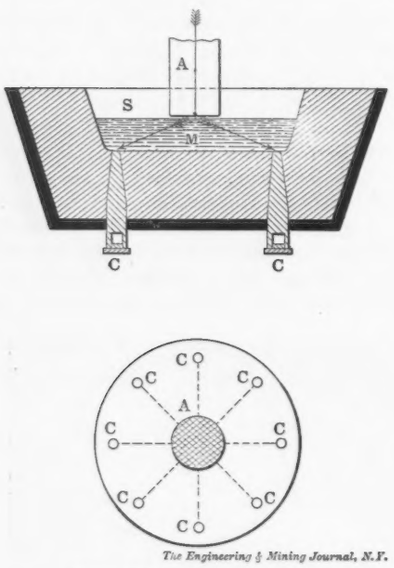
[1]Elektro-Metallurgie, III, Borchers, Ed. 1903, p. 536.

see a few years ago his old works, owned by the Société Anonyme Electrométallurgique Procédés Paul Girod, and later the new steel works owned by the Compagnie des Forges et Aciéries Electriques Paul Girod, both at Ugine, Savoie, France, with permission to make unrestricted use of my observations at Ugine for my lectures and all other publications.



The Engineering & Mining Journal, N.Y.

DIAGRAM OF GIROD FURNACE

A Combination of Resistance and Arc Heating

The Girod furnace is, as I mentioned above, the simplest of our modern electric steel furnaces, useful as an experimental furnace, or as a smelting furnace on the largest possible scale. I am using it in my laboratory with currents of 30 to 36 kw., and for steel smelting it is being used with currents of 300 and 1200 kw. It is a combination of resistance and arc-heating furnace. The metal to be smelted serves as one of the electrodes; it is covered by the refining slag as an electrolytic conductor while a carbon block (or several carbon blocks), entering from above through the cover of the furnace, forms the opposite electrode above the center of the bath. The arcs play between the carbon blocks and the slag, and no doubt here the largest amount of heat is produced. A second heat-producing place is the layer of slag through which the current passes to and from the metal. Finally the metal itself becomes an important heat producer on account of the effective manner in which the electric current is made to pass through the molten metallic body, and this is the most important feature of the Girod process.

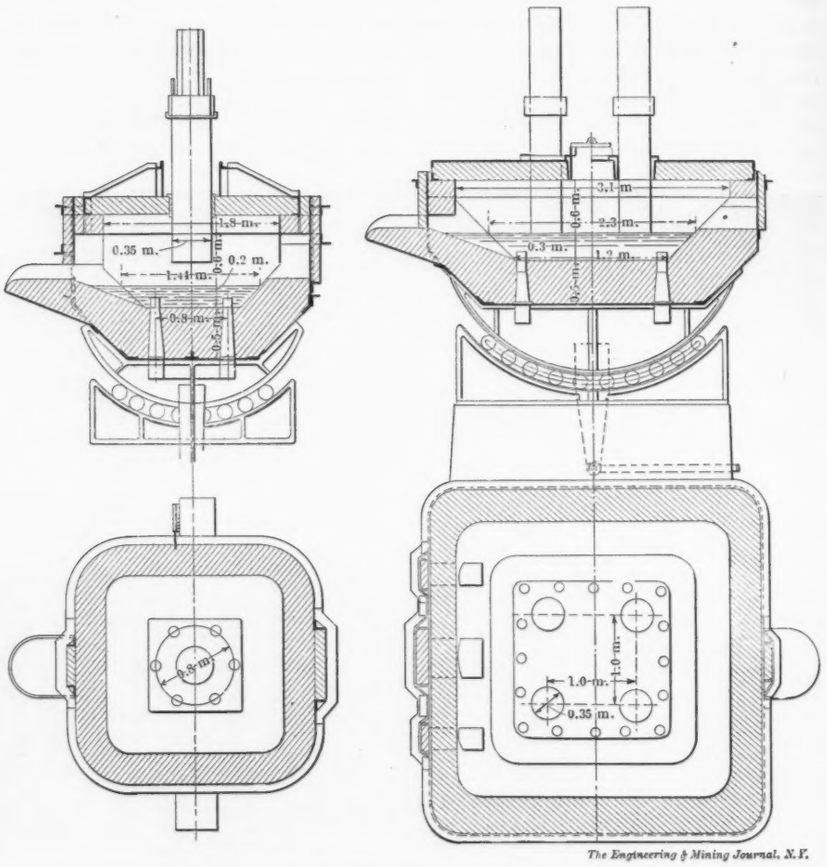
The distribution of the electric current through the molten metal is clearly shown in the accompanying diagram in which the letters indicate: *A*, carbon electrode; *S*, slag; *M*, molten metal; *C*, contact pieces to connect the metal with the current conductor. These contact pieces are of such cross-section and length that every one of them will take up only a certain part of the whole current without being exceedingly heated and, therefore, exceedingly increasing its resistance. An additional regulation of the temperature and resistance of each contact piece is effected by cooling the ends of these bodies, which contain small chambers, by means of circulating water. These bodies, made of pure iron to avoid any deterioration of the furnace charge, are thus not only the connecting rods between the furnace charge and the current generators, but they serve also as regulating current distributers, making the electric charges pass uniformly from and to the centrally hanging carbon rod or rods in radial direction to and from the periphery of the bath. This is important, not only for uniformly heating the bath, but also for keeping every part of the liquid metal in constant motion.

Running a furnace with as high a current density as is found necessary to smelt iron and steel, one can easily observe that the passage and the transformation of the electric current into heat is accompanied by a violent mechanical motion of all particles of the liquid. This movement, however, accelerates the contact between the impurities of the iron and the refining slag swimming on top of the bath. The Girod system of arranging the electrodes and contacts is a safeguard against any stagnation of parts of the liquid furnace charge, and for this reason the advantages of both the induction or transformer furnaces and the electrode furnaces are combined in the Girod furnace, while their imperfections have been overcome.

Cold Scrap or Molten Metal May Be Charged

The peculiar arrangement of electrodes and contacts gives the Girod furnace a special advantage over other electrode furnaces when cold scrap is to be smelted. Soon after charging the hearth of the furnace the upper electrode is lowered until it rests upon the heap of scrap; then the current finds no other way from the center of the heap than by means of numerous small arcs through the whole mass of scrap to the periphery of the heap on the hearth bottom. The heap is breaking down simultaneously in all parts in a very short time. There is no sticking of cold pieces to the bottom of the furnace and no necessity for stirring up and loosening such lumps from the hearth, thereby avoiding danger of breakage.

It will easily be understood, that if during a smelting operation pieces of the ends of the contact bodies melt and dissolve in the steel, no harm will be done to the latter as the contacts consist of pure iron; the quantity of iron which in such a case combines with the liquid

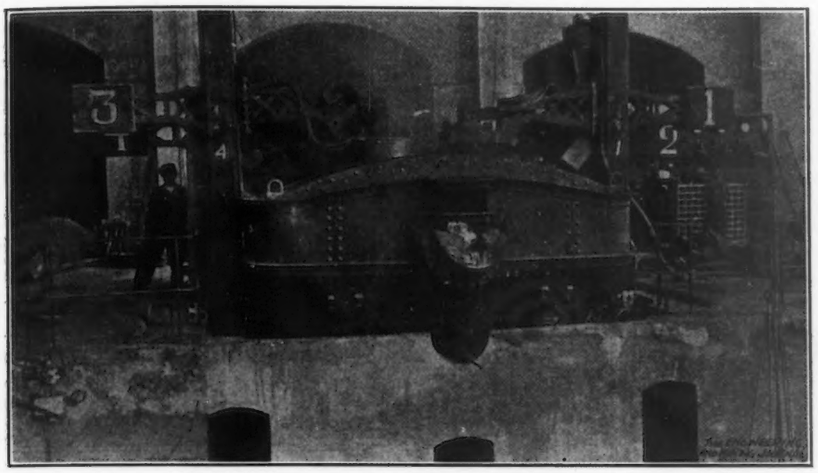


The Engineering & Mining Journal, N.Y.

DETAILS OF 2½-TON AND 12-TON GIROD FURNACES

charge of the furnace is proportionally so small that the qualities of the charge will not be influenced to any perceptible degree.

The applicability of the Girod furnaces is not at all restricted by the nature of the raw materials. They may be fed with cold scrap or with molten metal. When feeding cold scrap one does not put in the whole charge at once. After the larger part of the charge has been shoveled or otherwise thrown upon the hearth, the current is sent through the heap in the manner already described; the rest of the charge is put into the furnace together with the first batch of the refining ingredients. Taking the run of a 2-ton furnace as an example, the charge consists of 2000 to 2500 kg. of iron scrap, and the first batch of refining slag usually consists of about 80 kg. of lime (CaO) and 220 to 250 kg. of iron oxide ore. Together with the iron oxide that covers the scrap the iron ore serves as an oxidizing agent.

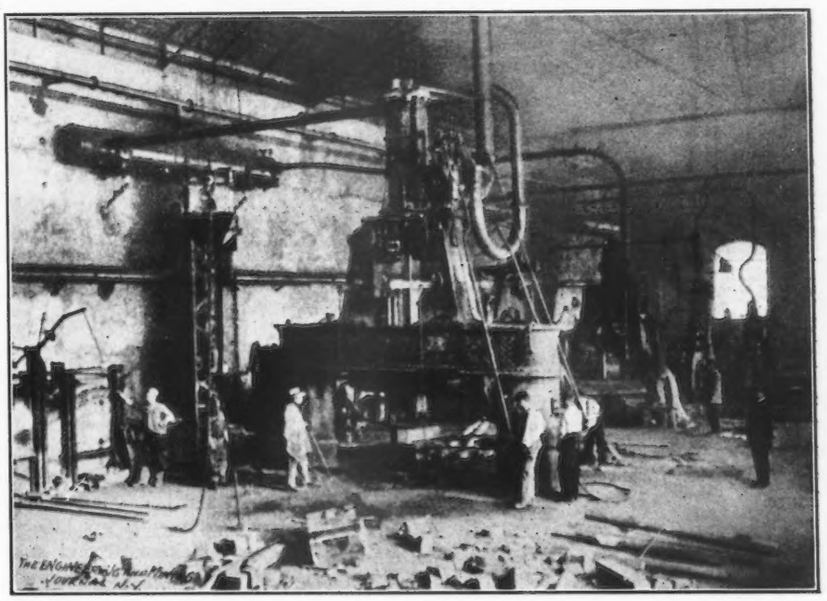


12-TON GIROD FURNACE DURING SMELTING

The smelting of the iron charge and the first batch of refining slag requires 4½ to 5 hours. This slag becoming exhausted of iron oxide and therefore of its oxidizing power, samples are taken and tested to ascertain the degree of refining of the molten metal. According to the degree of purification, the furnace now receives (after the first slag has been skimmed off) a second, and if necessary a third batch of lime-iron-oxide slag. After the removal of the last slag the surface of the metal bath is thoroughly cleansed by throwing in about 30 to 40 kg. of lime and skimming this off after a while. The further treatment of the iron bath depends upon the absence or presence of impurities which could not be removed by the lime-iron-oxide refining, and upon the quality of steel to be produced.

Depending upon these considerations, deoxidizing or other refining agents are employed; for instance, ferromangano silicon, ferroaluminium silicon, ferromangano-aluminium silicon and other alloys. For producing carbon steels Swedish charcoal iron or a kind of iron very rich in carbon produced in an electric furnace of the steel works is added.

The final step in the production of special steels is the addition of iron alloys with metals like nickel, tungsten, chromium and others after these refining operations. It is not the purpose of this paper to give a report on researches on the reactions during the refining process; I shall have to leave this to the special siderometallurgists; I wish today to deal only with the practical working of this useful electrometallurgical apparatus.



FORGING HALL AT UGINE

Calcined Dolomite Linings

The total duration of one smelting operation from the starting of the current to the casting of the product into ingots or molds covers about eight hours when the raw material is not pure. Pure raw material, of course, will require less time and power. The smaller of the two types of furnaces used in steel works is run with alternating currents of about 300 kw. at about 60 to 65 volts. The larger furnaces require 1000 to 1200 kw. at 70 to 75 volts. Taking in account a loss of 10 to 11 per cent. of the charge by oxidation and evaporation, the power required to make one ton of steel in a small furnace is 900 to 1000 kilowatt-hours; in a large furnace 800 to 900 kilowatt-hours.

The consumption of carbon electrodes amounts to 12 to 15 kg. per ton of steel, including the short pieces which remain in the holders when the latter have reached the lowest point at which they can withstand the radiating heat of the bath. The lining of the furnaces, mostly consisting of calcined dolomite, will withstand at least 80 charges, excepting the sidewalls into which cavities have been eaten by the slag around the level of the molten bath. These repairs are now required at short intervals of time, but the bottom of the furnace will stand 120 to 160 charges without repair. The thickness of the bottom will have lost at this time about 100 mm. Furnace linings will stand a considerably longer time if liquid charges are used. One of these furnaces was run during 200 charges without any repair. The linings of the furnace covers require more frequent renewing; in the small furnaces after 25 to 30 charges, in the larger ones after 20 to 25 charges. The other pieces of the furnace outfit are not worn out as fast as the linings and electrodes; the furnaces which so far have been put into operation still have their original outfit.

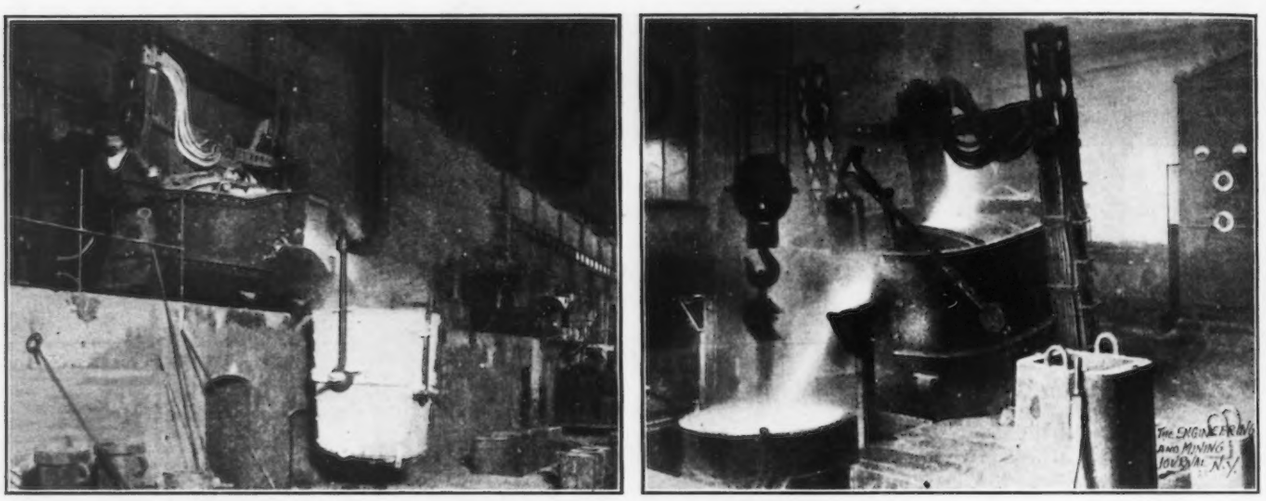
At the works at Ugine only scrap iron is used as raw material for steel making, as well as for the manufacture of iron alloys. The larger part of the scrap is

soft iron and steel, the smaller part pig and cast iron. The average percentage of impurities in the raw material used during a long period of operations was as follows: C, 0.4 to 0.5 per cent.; Si, 0.15 to 0.25; Mn, 0.5 to 0.7; S, 0.06 to 0.09; P, 0.08 to 0.1. What degree of refining can be reached in the Girod furnace will be seen from the accompanying list of analyses of the various steels produced.

The cost of the different types of Girod furnaces and the cost of complete plants are the following: A small 2½-ton furnace, including regulators for the electrodes, measuring instruments, tilting-device mechanism and the conductors from the furnace to a dynamo or transformer near the furnace room, costs about 15,000 fr. A large 12½-ton furnace with a like equipment will cost about 30,000 fr. The manufacturing cost of the electrodes amounts to 3 to 4 fr. per ton of carbon body. A complete plant with one 2½-ton furnace for regular running, one furnace for reserve, and with all appliances and smeltery building, but without dynamo or transformer, will cost approximately 200,000 to 300,000 fr.; a plant working with a large 12½-ton furnace, 300,000 to 400,000 francs.

ANALYSES OF STEELS MADE IN THE GIROD FURNACE.

Properties.	C, Per Cent.	Si, Per Cent.	Mn, Per Cent.	S, Per Cent.	P, Per Cent.	Other Constituents, Per Cent.
Very soft	0.079	0.106	0.205	0.015	0.012	....
Soft	0.236	0.180	0.431	0.012	0.010	....
Middle soft	0.283	0.208	0.430	0.014	0.010	....
Middle hard	0.388	0.155	0.342	0.011	0.009	....
Middle hard	0.463	0.204	0.463	0.010	0.016	....
Hard	0.596	0.198	0.302	0.017	0.005	....
2 per cent. nickel	0.076	0.099	0.101	0.014	0.010	2.12 Ni
3 per cent. nickel soft	0.06	0.123	0.209	0.013	0.007	3.47 Ni
3 per cent. nickel hard	0.364	0.144	0.435	0.012	0.015	3.41 Ni
5 per cent. nickel soft	0.134	0.148	0.375	0.016	0.013	5.25 Ni
5 per cent. nickel middle soft	0.250	0.157	0.414	0.010	0.015	5.08 Ni
Nickel-chrome	0.420	0.199	0.500	0.010	0.009	2.53 Ni 0.77 Cr.
Tool steel	1.223	0.168	0.224	0.011	0.010	....
Tool steel	1.474	0.119	0.264	0.015	0.007	....
Tool steel	1.010	0.219	0.306	0.008	0.009	0.32 Cr.
Tool steel	1.277	0.230	0.130	0.009	0.006	0.24 Cr.
Tool steel	1.251	0.176	0.258	0.010	0.008	1.21 Cr. 0.49 Ni
Tool steel	0.689	0.029	0.096	0.012	0.009	6.07 Cr. 0.46 Mo 25.82 W.



2½-TON GIROD FURNACES IN OPERATION IN FRANCE AND BELGIUM

The Old Plant at Ugine

To carry out the Girod processes for the purpose of making alloys and steel, a company under the name Société Anonyme Electrométallurgique Procédés Paul Girod, Ugine, Savoie, France, was created several years ago. This company owns the Girod alloy works where the first experimental two-ton steel furnace was tried. The fact that today 19 furnaces with 400 to 600 electrical h.p. are kept running, and that 12 new furnaces of 1200 electrical h.p. each are being put up, shows to what extent this manufacture has been developed. In the future these old works will do only the alloy business and the old steel furnace will be transferred to the new steel works.

This company also owns an electrode factory with the most perfect and modern equipment for turning out daily 10 to 12 tons of electrode carbons in diameters up to 350 mm. and in lengths up to 1600 mm. of round or square cross-section. At present only 7 tons are made, for which only one furnace is required; a second furnace will be built as soon as the demand for electrodes increases. The raw materials for the electrodes are retort graphite, petroleum coke, anthracite coal and anhydrous tar. The solid materials are ground in ball mills, kneaded with tar in double-screw mixers and upon chilean mills. The scarcely plastic mixture is then stamped into big blocks which finally are pressed into blocks of the dimensions given above. The burning of these blocks is done in gas-fired ring furnaces, in the chambers of which large fire-clay tubes take up the pressed blocks under a covering of ground coal.

The company owns several water powers. The dam which was built for the old works is situated about 3 km. above Ugine on the Arly river. Here a strong dam with gates sends the water into a tunnel which leads it to a pipe line directly above the power house at Ugine. Nineteen Pelton wheels drive as many dynamos direct coupled to the wheels, furnishing a total of 8000 to 9000 electrical h.p. The second power station, furnishing an additional 12,000 electrical h.p., is situated above Le Fayet. The tunnel and pipe lines are large enough for carrying the water for 20,000 h.p., but the machine house is fitted with turbines and dynamos for only 12,000 h.p. It will soon be enlarged. The three-phase current is sent under 45,000 volts to Ugine. It is transformed here into currents of 2500 volts for the large machines, and 60 to 75 volts for the furnaces. The 2500-volt current is transformed into a current of 500 volts, and this into a 110-volt current for lighting and small motors and a 500-volt direct current for locomotives, cranes and the like.

Besides this power the works of Ugine are leasing from a power station at Bionnay, on the Bonnant river near St. Gervais, 6000 electrical h.p., and from the Société d' Electrométallurgie Sud-Est, at Veuthon near Albertville, during the winter months (Oct. 1 to April 1) 8000 to 10,000 electrical h.p. From both stations the

current is furnished under an e.m.f. of 45,000 volts. The current from St. Gervais is conducted to Le Fayet and there enters the Le Fayet-Ugine line.

New Steel Works

For the production, and for the first mechanical and thermal treatment of the special steels, a new company also under the management of Paul Girod has been formed (the Compagnie des Forges et Aciéries Electriques Paul Girod) whose works have been built about 1 km. below the old works. The electric current for these works is bought from the old company, the Société Anonyme Electrométallurgique Paul Girod.

The installations which have been provided for the new steel works, most of which are now in running order, are the following: Three electric furnaces of 2 tons capacity each, one of which works only for small steel castings; two large electric furnaces of 10 to 12 tons capacity each. The steel produced in all of these furnaces, except the one mentioned, is cast by means of large ladles, worked by electric cranes, into ingots which go to the rolling mills. Working with several furnaces for steel castings, pieces (dynamo frames) up to 20,000 kg. have been made. For the mechanical and thermal treatment of the steel ingots the most effective modern machinery has been erected.

The rolling mill has two 3-tier rolls, one of which is able to take ingots up to 525 mm. diameter and 400 kg. weight and roll them down to rods of 125 mm. diameter, while the other will roll ingots of 325 mm. diameter to smaller round, square and otherwise-profilated rods. The other equipment of this mill consists of two furnaces for heating the ingots before they go to the rolls, and of the necessary cutting and sawing machinery for the rolled blocks.

A large forging hall contains 9 hammers operated by compressed air. The largest of these hammers weighs 5000 kg.; the weights of the other 8 hammers are from 1000 to 100 kg. Here specially tough forgings are made for automobile machinery, shaftings, gears, tool-steel rods, projectiles, etc. Besides several annealing furnaces already in operation, a large hall is being built for tempering, annealing and hardening large forged or cast-steel pieces. A second forging hall is being erected which is to be fitted with one 1000-ton forging press, one forging hammer of 10 tons hammerweight, and three stamps with falling hammers of 3000, 2000 and 1000 kg. respectively.

The steel foundry contains a carpenter shop for making the models, a sand separating plant, a number of molding machines, the necessary molding frames, drying and heating furnaces and an air-sand-jet plant for cleaning the castings.

The foundry with its present equipment will be able to turn out about 10 tons of steel castings daily, but, as mentioned above, pieces up to 20,000 kg. may be cast. A mechanical workshop is now being built and will soon be completed.

The analytical laboratory at the old works is doing the analytical investigation for both companies; 15 chemists and assistants are employed. A laboratory for mechanical and physical tests of the products is connected with the new works. It is fitted with all appliances to determine the mechanical strength and to investigate the microstructure and changes of the latter on mechanical and heat treatment. The two companies are erecting sanitary quarters and comfortable dwelling houses for their workingmen and other employees.

I have been informed that, besides the two Girod companies mentioned above, the following firms have ordered Girod furnaces, some of which have been running for some time: Oehler & Cie., steel foundry in Aarau, Switzerland; Société John Cockerill, iron and steel works in Seraing, Belgium; Stotz & Co., steel foundry in Kornwestheim near Stuttgart, Germany; Stahlwerk Becker, Krefeld, Germany; Gutehoffnungshütte (one of the largest and oldest coal-mining, iron and steel-smelting works in Germany) in Oberhausen; Ternitzer Stahlwerk, Schoeller, in Ternitz, Austria; Danner & Co., steel works in Judenburg, Austria; Ungarisches Staats-, Stahlwerk in Diosgyor, Hungary. From this, it is apparent that at last the Girod furnace is earning well deserved attention and success.

Asbestos in Canada

Asbestos is mined in Canada in the Eastern townships of Quebec, at Black Lake, Thetford, East Broughton and Danville. Several other occurrences of the mineral have been reported from various parts of the Dominion, but mining is only being conducted in the above district at the present time. The mining of asbestos in this region dates from about 1878, and the value of the annual output has grown from less than $25,000 in 1880 to over $2,573,000 in 1908. At the present time asbestos stands next to coal in the list of nonmetallic minerals produced in Canada. According to the report of the Department of Mines the total shipments in 1908 aggregated 90,773 tons, valued at $2,573,335, which is slightly better than the record of the previous year.

A portion of the Canadian asbestos is of sufficiently high grade to be shipped crude, the greater part, however, is crushed and has the fiber extracted by special machinery. As yet a uniform system of classification has not been adopted by the operating companies but for statistical purposes the crude is divided into two classes, the mill fiber into three grades, and short fibered, asbestic, and sand separately classified.

Oriental Consolidated Mining Company

The annual report of the Oriental Consolidated Mining Company, operating 7 mines in the Wunsan district, Korea, states that during the fiscal year ended June 30, 1909, 293,828 tons of ore of an average grade of $5.77 per ton were mined by the company. In addition to this 2589 tons of an average grade of $7.60 per ton were produced by tribute mines. The cost of mining in the company's operations was $1.59 per ton. The net receipts were $556,370, an increase over a year ago due to an increased grade of ore mined.

Development work as follows was done: Shafts, 313 ft.; main drifts or tunnels, 11,223; side drifts, 1629; crosscuts, 3585; raises or winzes, 6539; total, 23,289. Most of this work was done on the Tabowie and Taracol mines. The ore reserves at present amount to 733,882 tons worth $3,243,866.

The seven mills of the company crushed 296,417 tons of ore worth $1,716,104. Of this, 89.3 per cent. was saved in bullion and concentrates. The Tabowie and Maibong mills have been improved and a capacity of 325,000 tons is expected during the present year. Milling costs were 58c. per ton.

The Chorrie dam to furnish power has been completed. This dam is 86 ft. high and has a 6-ft. spillway 160 ft. long in the center. The company also owns its own cord-wood railways, schooners, etc., and maintains a free hospital where 15,652 cases were treated during the last year.

Dolores Mines Company, Mexico

The quarterly report of the Dolores Mines Company, Chihuahua, Mexico, states that conditions at this mine are most satisfactory. For the months of July, August and September the revenue was $298,610; expenses, $167,169; profits, $131,441. The dividend rate is 18 per cent. and the earnings have been at the rate of 26 per cent. per year. During October the mill crushed 3500 tons.

From the main tunnel a raise has been driven over 50 ft. in ore averaging $35 to $40 per ton and 5 to 6 ft. wide. Above No. 3 level the No. 2 orebody was again encountered. The ore is of good grade. The faces of the north and south drives on the bottom level are now about 360 ft. apart; both are in $40 ore. About 30 ft. above this level in the south drive some high-grade ore averaging over $100 has been encountered.

According to the *Aust. Min. Stand.*, Sept. 8, 1909, a deposit of telluride of gold and silver was recently discovered in the Maratoto district, New Zealand.

Gold and Silver Production of the United States

The United States Geological Survey and the Bureau of the Mint, acting in coöperation in the examination and analysis of reports from private refineries and records of Federal mints and assay offices, have determined the finished product from domestic mines in 1908. The unusual delay in furnishing these figures this year has been caused by wholly unlooked for difficulties in adjusting the data furnished.

The completed statement for 1908, as compared with 1907, is as follows:

	1907.	1908.	Changes.
Gold, fine oz	4,374,827	4,574,340 I.	199,513
Value	$90,435,700	$94,560,000 I.	$4,124,300
Silver, fine oz	56,514,700	52,440,800 D.	4,073,900
Comm. value	$37,299,600	$28,050,000 D.	$9,249,600

The decrease in value of silver is much greater than in quantities, owing to the lower average prices. As compared with the preliminary estimates, published last January, the revised figures are $1,753,256 less for gold, and 642,053 oz. greater for silver. The differences are largely due to the difficulty of separating foreign from domestic material in the earlier reports.

Gold Production by States

The gold production by States for two years is given in the accompanying table, the figures given being the values:

GOLD PRODUCTION OF THE UNITED STATES.

	1907.	1908.	Changes.
Ala	$27,400	$41,200 I.	$13,800
Alas	18,489,400	19,858,800 I.	1,369,400
Ariz	2,664,000	2,500,000 D.	164,000
Cal	16,853,500	19,329,700 I.	2,476,200
Colo	20,897,600	22,871,000 I.	1,973,400
Ga	64,800	56,200 D.	8,600
Idaho	1,255,900	1,443,500 I.	187,600
Mont	3,472,600	3,160,000 D.	312,600
Nev	15,411,000	11,689,400 D.	3,721,600
N. H	.....	3,700 I.	3,700
N M	330,000	306,300 D.	23,700
N. C	78,700	97,500 I.	18,800
Ore	1,222,200	905,900 D.	316,300
S. C	58,100	53,700 D	4,400
S. D	4,138,200	7,742,200 I.	3,604,000
Tenn	3,800	3,700 D.	100
Tex	1,000	500 D.	500
Utah	5,121,600	3,946,700 D.	1,174,900
Va	8,300	3,600 D.	4,700
Wash	262,300	253,700 D.	8,600
Wyom	9,400	7,600 D.	1,800
Total States	$90,369,800	$94,274,900 I.	$3,905,100
Philippines	64,700	284,500 I.	219,800
Porto Rico	1,200	600 D.	600
Total	$90,435,700	$94,560,000 I.	$4,124,300

The larger increases were in South Dakota, California, Colorado and Alaska; the larger decreases in Nevada and Utah. Colorado continues to be the leading State in 1908, with Alaska second and California third, though the comparatively large gain in California put it very close to Alaska. Nevada remained fourth and South Dakota took the fifth place, passing Utah, which stood fifth in 1907. The total gain last year over 1907 was 4.6 per cent.

Silver Production by States

The production of silver in the various States is shown in the accompanying table for 1907 and 1908; the figures being in fine ounces:

SILVER PRODUCTION OF THE UNITED STATES.

	1907.	1908.	Changes.
Ala	600	400 D.	200
Alas	179,300	204,600 I.	25,300
Ariz	2,903,100	2,900,000 D.	3,100
Cal	1,590,000	1,703,700 I.	113,700
Colo	11,495,400	10,150,200 D.	1,345,200
Ga	700	200 D.	500
Idaho	7,888,400	7,558,300 D.	330,100
Ill	2,900	2,000 D.	900
Mich	331,300	294,100 D.	37,200
Mo	25,300	49,400 I.	24,100
Mont	11,129,600	10,356,200 D.	773,400
Nev	8,280,500	9,508,500 I.	1,228,000
N. H	.....	6,300 I.	6,300
N. M	599,500	400,900 D.	198,600
N. C	25,200	1,300 D.	23,900
Ore	96,000	56,100 D.	39,900
S. C	100	200 I.	100
S. D	106,600	197,300 I.	90,700
Tenn	58,300	60,900 I.	2,600
Tex	305,300	447,000 I.	141,700
Utah	11,406,900	8,451,300 D.	2,955,600
Ver	3,800	..... D.	3,800
Va	200	300 I.	100
Wash	84,000	86,800 I.	2,800
Wyom	1,600	3,500 I.	1,900
Total States	56,514,600	52,439,500 D.	4,075,100
Philippines	100	1,300 I.	1,200
Total	56,514,700	52,440,800 D.	4,073,900

The total decrease was 7.2 per cent. The only important increase in 1908 was in Nevada; the larger decreases were in Utah, Colorado and Montana. As a producer Montana took the first place in 1908, Colorado dropping from the first place in 1907 to the second in 1908, and Utah from second to fourth. Nevada held the third place last year and Idaho the fifth.

The Potash Salts Situation

Special Correspondence

Advices lately received in Washington are to the effect that the German government is still contemplating the presentation of legislation designed to improve the position of the potash producers in that country. The information now at hand appears to point conclusively to a decline in the favor with which the notion of export taxes or other discriminating legislation was at first regarded; and this is ascribed to the attitude which has been adopted by our officials who have given positive expression to the belief that the passage of any such legislation, under existing circumstances, would be construed from our side as an "undue" discrimination by virtue of the terms of the Payne-Aldrich tariff.

The German government is now inclined rather to favor a plan whereby the formation of a new and close organization controlling the potash mines would be effected. This would still leave open the difficult question of the long term contracts already closed with the American interests, and it is not believed that such an organization could be brought about unless some feasible plan for abrogating or disposing of the American contracts could be developed. The chief interest felt in the situation from the administrative standpoint is found in the apparent abandonment of the proposed export-tax scheme. It seems evident, from this side, that the Kali-Syndikat cannot be revived, at least in its old form.

Decision in Elmore Flotation Patents

Special Correspondence

The litigation on the subject of ore flotation patents, which has been going on for some time, has now advanced a step by the publication of the judgment of the House of Lords on the action brought by the Minerals Separation, Ltd., versus the British Ore Concentration Syndicate, Ltd., and Alexander Stanley Elmore. The court of appeal, over which Lord Justice Fletcher Moulton presided, reversed the decision of the court below and decided that the Minerals Separation process was an infringement of the Elmore patent of 1901. This judgment has now been reversed by the higher appeal court of the House of Lords.

In giving judgment the Lord Chancellor said: "I greatly regret to differ from the court of appeal in this case, but it seems to me that when this very skilfully drawn specification (Elmore's 1901 patent) is closely read, the only claim is for acidulation; the only discovery alleged is the merit of acidulation, and the process to which acid is to be applied is described in terms so wide that it covers any process, certainly any known process, of separating mineral substances by the selective action of oil in a mixture of ore, water and oil. I cannot agree with Lord Justice Moulton that the claim in this specification is the use of a small amount of added acid in the process described, that is, in a process where the ore is pulverized and suspended in water so as to make a freely flowing pulp, and is mingled with oil, so as to cause a selective flotation. The specification expressly says it is not confined to any definite proportion of acid. And, what is more important, the making of a freely flowing pulp is only stated to be what is generally done. It is not claimed as an essential feature of the mixture to which acid is to be added. It is this definition of the 1901 claim, erroneous as I respectfully think, which was at the root of the judgment of the court of appeal."

The defendants have to pay the costs of this appeal, as well as that heard in the courts below. It may be noted in this connection that the German Patent Office refused a patent to the Minerals Separation, Ltd., as an infringement on the Elmore process used by the licensees of the Ore Concentration Company, Ltd. The vacuum process used by the licensees of the Ore Concentrating Company is not involved in this litigation.

The Story of the St. Paul Mine Fire

Details of Worst Disaster That Ever Occurred in Illinois, and the Lessons to Be Learned. Miraculous Escape of 20 Men after 7 Days Imprisonment

BY FLOYD W. PARSONS

It is always possible to show afterward how a mine accident could have been prevented. However, the dangers incurred in mining coal are so great that even the most careful engineers hesitate at the task of criticizing. No one who is familiar with present conditions will deny that the coal-mining industry in America is traveling the road to greater safety at a more rapid pace than ever before. There are those who would lift us up and land the industry at the end of the journey immediately. Such a course, however, is unwise and might cause the retracing of many steps.

Following every serious disaster, there is much talk and some action on the part of those interested in eliminating the dangers. This flurry soon dies out and the laborious journey is resumed at the normal pace. One thing results, however, and that is that each accident furnishes lessons that never can be forgotten.

The catastrophe at the St. Paul mine at Cherry, Ill., is the worst accident which has ever occurred in the mines of that State. The mine in question is located on a branch of the Chicago, Milwaukee & St. Paul railroad and is owned and operated by this latter company. The output is used almost entirely by the railroad company in its locomotives. The surface plant was most complete and cost something like $250,000. The tipple is a three-track steel structure with shaker screens, weigh hoppers, cross-over dumps, steam pushers, steam transfers and tandem cages. Such tipples are common in northern Illinois, where the coal lies 300 ft. or more below the surface, and the seams are thin. Some of the coal passing over the screen is loaded into cars by a box-car loader.

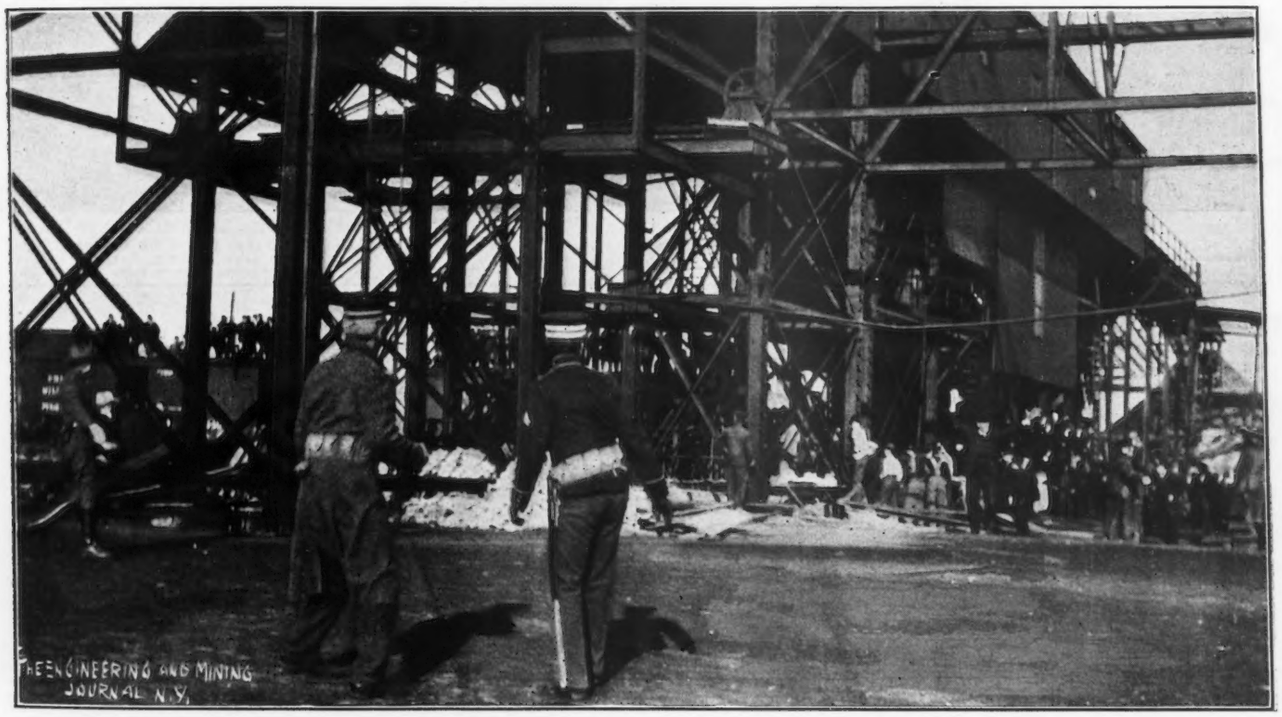
The ventilation at the mine is furnished by a modern, high-speed Clifford-Capell fan. This machine is a double inlet, direct-blowing, reversible fan, 16 ft. in diameter and 6 ft. wide, and is connected direct to a high-speed engine. The fan foundations are of concrete, and the housings of steel, concrete and brick.

The shafts penetrate three separate beds of coal. The No. 1 seam being topmost, the No. 2 below that and the No. 3 seam at the bottom. Work has been progressing only in the No. 2 and No. 3 seams. The No. 2 seam was worked on the room-and-pillar system, while the lower, or No. 3 bed, was worked on the longwall plan.

The No. 2 seam at the Cherry mine, is practically the only bed that is worked room-and-pillar in this northern district of Illinois. The No. 2 bed is 380 ft. below the surface, while the No. 3 seam is about 500 ft. down.

The Longwall System

The method of longwall development carried on in the No. 3 seam, and typical throughout northern Illinois, is to undercut the face of the coal, and then to snub and sprag it before going home at night. In the morning when the miners return, the sprags are knocked out, and the weight of the overlying strata brings down the coal. The undercut is sometimes made in the coal, but more frequently in the clay underlying the coal bed. In this system of longwall, a high percentage of good coal is obtained, and no powder at all is used. I desire at this time to correct a statement made by myself in an article published in The Engineering and Mining Journal, October 23. On page 810 of the issue just mentioned, I stated that the system of longwall as practiced in Illinois was not long-



AFTER 7 DAYS WAITING, AND WITH HOPE ABANDONED, NEWS WAS SHOUTED UP THE SHAFT THAT MEN HAD BEEN FOUND ALIVE. THIS VIEW CAUGHT THE MAN AT THE SHAFT REPEATING THE GLAD NEWS

wall in the true sense, as shooting from the solid was universally practised. Mr. Bement, of Chicago, called my attention to this error, and I propose in a later issue of the JOURNAL to describe the Illinois longwall system in detail, and to state that the general method of development along these lines is admirably adapted for the local conditions that prevail.

How the Mine Fire Started

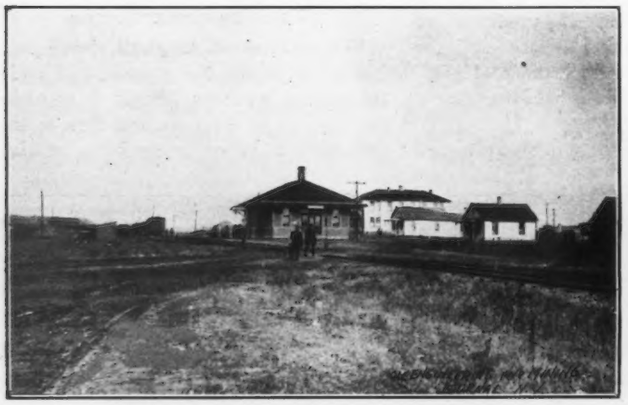
When the time arrives that coroners' inquests will disclose true facts concerning mine accidents, we will all then be content to wait and publish only the story as told before such a tribunal. At present, however, the inquests are of small importance and of even less value from an educational point of view. No one is ever found guilty (unless he is dead) and the company is most always shown to be blameless.

The St. Paul mine is located in a district where gas is almost unknown; as a consequence naked lights are used in this and other mines of the district. I may say at the beginning that I do not believe that there was any explosion of any kind in the underground workings, except perhaps a can or so of powder that had been taken into the No. 2 seam by the miners.

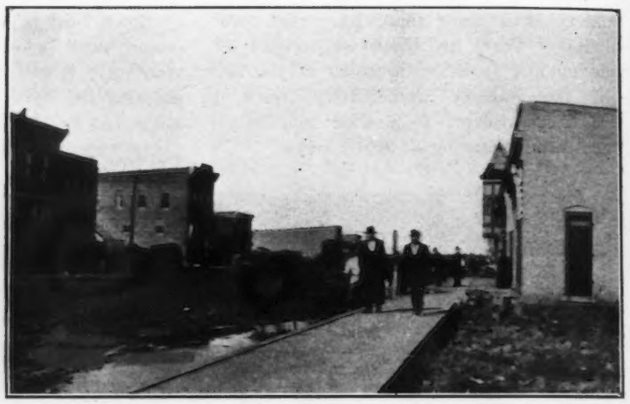
It is often the case that the explosion of a can of powder in a mine is sufficient to raise and ignite dust, causing the mine to be literally torn to pieces. The gases pervading every crevice of the workings and coming from the mine after such an explosion are not easily mistaken for the black-damp that follows a mine fire. There are a score of reasons tending to prove that there was no explosion of gas or dust at the St. Paul mine; however, it is improbable that anyone will claim an explosion occurred, so at present it is unnecessary to defend the statement that none occurred.

The truth concerning the cause of the fire is as follows: The mules used in the No. 2 seam were kept in a stable near the main shaft; this made it necessary for the stablemen to lower hay to serve as feed for the animals. Shortly after 1 o'clock on Saturday, November 13, a load of hay came down to the No. 2 seam and was pushed off the cage toward the mine stable. The entry leading to the stable and the stable itself were ordinarily lighted by electricity; several days previous to the fire, one of the main cables had become burned out, and in the meantime open or naked lights were used to illuminate the stable. Several of the torches were hung, or rather stuck along the side of the entry. One of these lights ignited one of the cars of hay, and the flames spread with such rapidity that the efforts of the men nearby to extinguish the flames were unsuccessful. A large number of the men scenting danger made a dash for the shaft, while others stood their ground and fought the fire. It seems that at this point some of the men became panic stricken, and one car of the blazing hay was pushed along the entry to the shaft that connects the No. 2 and No. 3 seams. Engineer Raisbeck was in charge of hoisting in this latter shaft, and he states that he was directed to raise the cage to about 4 ft. above the landing in the No. 2 seam; this was done so that the men could push the burning hay underneath the cage and have it drop down to the bottom of the pit in the No. 3 seam where there was water. Engineer Raisbeck said he lowered his cage twice after this, bringing men up both times. On the second trip up, the cager who was supposed to give signals in the No. 2 seam came up. Raisbeck also says that after the cager (Bill Smith) came up from the No. 2 seam, no more signals were received, and he let his cage remain at the bottom.

One of the most important points that should be brought out at the coroner's inquest is the time of day that the fire started. Practically all of the reliable information which can be obtained points to about 1:30 p.m. Engineer Raisbeck says he first discovered smoke coming from the main shaft at 1:30, and that he

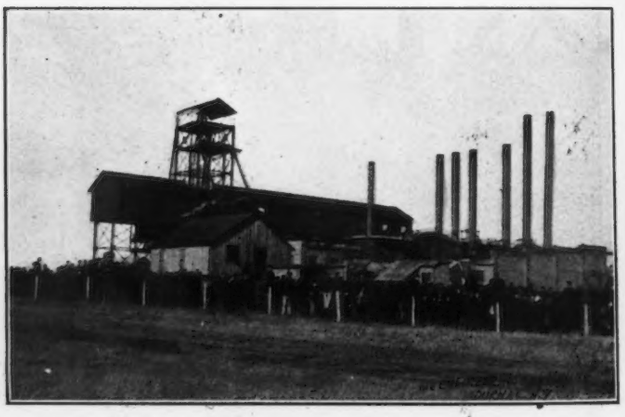


THE RAILROAD STATION AT CHERRY, ILLINOIS



VIEW SHOWING MAIN STREET IN TOWN OF CHERRY

A ROW OF MINERS' HOUSES



CROWD SURROUNDING TIPPLE SOON AFTER THE ACCIDENT

immediately helped two of the machinists reverse the mine fan. Engineer Cowley, who had charge of hoisting the men from the No. 2 seam to the surface in the main shaft, says that it was about 1:30 when he first saw smoke arising from around the fan house. Charles McDonald, one of the men who was rescued, was working in the No. 2 seam near the stable. His statement is as follows:

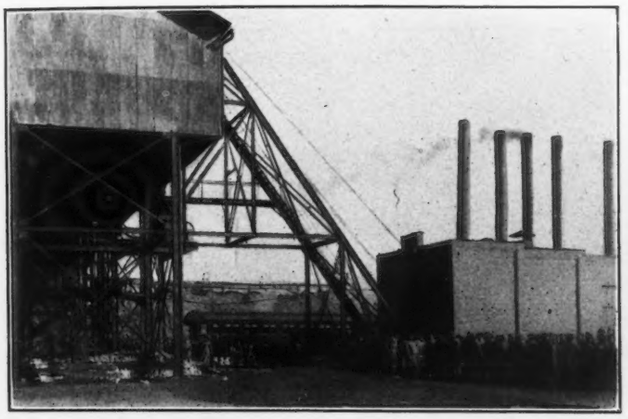
"All of a sudden there was a yell from one of the men, and I saw smoke coming from the hay. I immediately started for the hay with a number of other men. Before we got there it was all on fire and there was no chance of putting it out. Then there was a rush for the main shaft. Everybody was scared almost to death and men ran over each other in getting to the cage landing. I fought my way to the opening and fought back the men who were trying to crowd me out. We waited and it began to get hotter. Then the cage came down and got me, and I don't remember anything else."

Perhaps the most serious charges against the company are those made by miners who claim that more than an hour elapsed before any alarm signal was given. It was also charged that the company continued to hoist coal for some time after the fire had started and that the mine bosses ordered some of the men back to work after they had discovered that the mine was afire and tried to leave the workings. I believe such stories are exaggerated, and I know from actual facts that the mine officials in every instance acted with great bravery and interest in the welfare of the men.

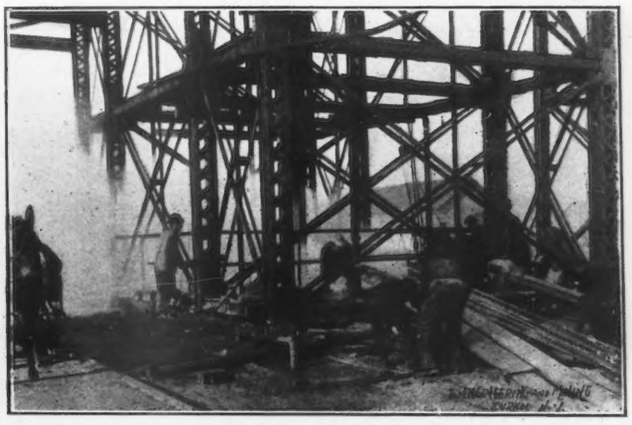
If no alarm was given, it was because the mine bosses believed to the last moment that they would be able to extinguish the flames, and although it is easy to say afterward just what should have been done, it is practically certain that those in charge acted in accordance with their best understanding.

For some reason or other many witnesses modify their statements when questioned at the inquest. It will, however, be interesting if one miner, who was rescued, repeats the following story under oath:

"It was long past 3 o'clock on Saturday afternoon that a little French boy—one of the trappers whose name I did not know—rushed up to his father and said: 'Pop, the mine's afire.' We were down in the No. 3 seam. The cry soon spread that the mine was afire, and all of us, about 175 men, who were in the No. 3 seam rushed toward the cage. John Brown, the cager, was surprised. He said 'what are you fellows getting excited about? Ain't you got any nerve? Stick.' Brown was game. Finally I said: 'This is serious. For God's sake Brown take us up.' Brown rang, and after repeating the signal many times he got no reply. Then he said that the Polish fellow in the No. 2 seam was not watching his job. Brown said: 'The Polish guy refuses the signal. He must have run.' My cousin and I and a number of other men who were down in the No. 3 seam scaled the interior of the shaft. There was general confusion, and when I reached near the top I was shocked to have other human bodies fall down on my head. The poor devils had climbed the interior, but were overcome. When I reached the No. 2 seam, I fought my way 200 ft. northeast to the main shaft, climbed over dead mules, the carcasses of human beings, stumbled and fell among the torches, picks, shovels, dinner buckets and other things that the sufferers discarded in their flight. Only one man—John Lundy the mine superintendent—I recognized. I saw his light. Finally, after what seemed to me like eternity, I reached the shaft. Lundy, who was in the rescuing party, grabbed me and put me on the cage that brought us to the surface. He went down again and perished. Brown, the cager at the No. 3 seam, died also."

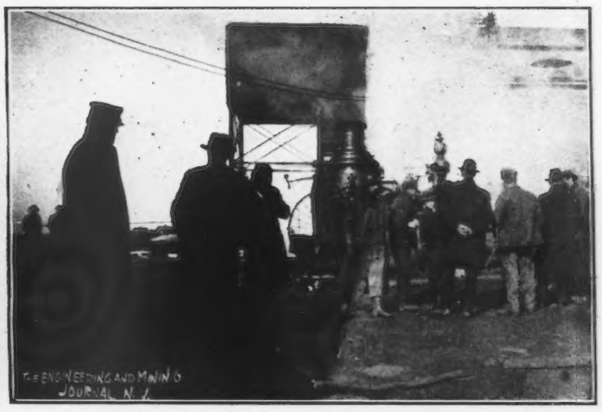


ROPES WERE STRETCHED AND THE MILITIA KEPT BACK THE CROWD



IT WAS FOUND NECESSARY TO SEAL THE MAIN SHAFT

THE FAN WAS BURNED OUT IN LESS THAN TWO HOURS AFTER THE FIRE STARTED



FIREMEN FROM CHICAGO WERE BROUGHT TO THE SCENE

The fan before described was acting as a blower, but as soon as the fire was discovered, this ventilator was reversed so that air would be drawn down the main shaft instead of being forced out that way. At 3 o'clock Saturday afternoon, about one hour and a half after the fire started, the fan was burned out. The mine officials immediately ordered another fan from the Spring Valley Coal Company, several miles distant.

Rescuers Perish

Shortly after 2 o'clock on Saturday afternoon a rescue party consisting of 11 men was lowered into the mine. The first trip was unsuccessful and no miners were brought to the surface. On the five succeeding trips a large number of men were brought up. When several of the rescuers went down on the seventh trip no more men were saved and all of the rescuers themselves perished. It was with reference to the loss of the lives of these men that much discussion occurred. Engineer Cowley was severely censured and for a time it seems that he was in danger of personal violence. I believe the truth of this matter is about as follows: On this seventh trip, Engineer Cowley was signaled to hoist, then to stop and then to lower twice. Cowley says that the stop signal came as the cage reached the first cross timber in the shaft 8 or 9 ft. up. In another moment a signal came to hoist, which was again followed by a signal to stop and another signal to lower. Cowley again lowered the cage to the bottom and got no more signals. The cage remained on the bottom for about 10 min., when several men hurried to the engine room and demanded that the cage be raised at once. After waiting a little longer for signals Cowley hoisted the cage, and when it reached the surface all of the men on it had been suffocated and burned. Probably the true solution for this confusion of signals to the engine room is about as follows: When the cage started up on its last trip, some miner who had just reached the foot of the shaft saw the cage disappearing and immediately signaled the engine room to stop and then lower. After he got on and the cage started again another miner rushed up and signaled for the cage to stop and lower again. All of the men on the cage during this interval were completely at the mercy of the men at the bottom who were giving the signals. After the second man piled on the cage, the entire party were overcome by fire and gases and were unable to signal to hoist. Engineer Cowley was accustomed to obeying his signals and in a way is hardly to blame for not having hoisted sooner.

The Mine is Sealed Up

The first man was saved at 2:30 p.m. The cage was hoisted the last time with the dead rescuers at 4:30. Previous to this the fan had been burned out and ventilation had practically stopped. When the fire started there were 527 men in the mine. Before the last hoist was made Saturday afternoon, 124 men had escaped and been rescued.

Shortly after this last hoist was made, it was decided to seal the mine, the officials believing that if the flames were permitted to burn, the shaft would soon be completely destroyed and probably cave-in. It is probable that no mine officials at any time, in any country, have ever been compelled to decide a more serious problem on such short notice. Here was a case where several hundred men were confined underground and to seal the shafts seemed almost like murder, but on the other hand, to leave the shafts open would have caused even more certain destruction and probably would have closed all exits of escape. The mine officials were severely censured, not only this first time, but several succeeding times when they sealed the shafts. I do not think such censure is justified, and I believe all experienced mining men will agree that no other course was left open. Had adequate facilities for fighting fire been present, a different course might have been successfully pursued.

After the mine was closed Saturday

ONE OF THE SURFACE BUILDINGS WAS TURNED INTO A TEMPORARY MORGUE

A LARGE TENT WAS USED AS A PLACE FOR IDENTIFICATION

THE GOOD NEWS OF HER HUSBAND'S RESCUE WAS TOO MUCH FOR ONE WOMAN

THE WIFE OF A RESCUED MINER RUNNING TO THE HOSPITAL CAR

afternoon, nothing further was done until midnight Saturday, when a large bucket was lowered in the shaft several times. Each time this bucket came back empty. The mine was opened again Monday morning, but no men were rescued and nothing of importance was accomplished, and as the flames seemed to be fanned by the fresh air, the shafts were closed again Monday afternoon. By this time a new fan had been brought over and installed, and 30 minutes after the air had started to circulate the flames were again intense, so that the officials were obliged to stop ventilation. By Monday afternoon, practically every official had made a statement, declaring that no men could possibly be alive and all hope was abandoned.

lowered into the mine. On Thursday, Nov, 18, the air shaft was opened, and the first of the entombed miners were brought to the surface. On Saturday, the 20th, 21 miners who had retreated from the shaft and barricaded themselves in a long chamber, were resurrected and 20 of these men brought to the surface alive. The remarkable photograph accompanying this article shows the situation on the surface when this first glad news was shouted from the shaft. When the news came up that men were found alive in the mine, hope was then revived that perhaps a majority of the entombed miners were still living. The story of the rescue of these men is best told by one of them himself: "I was in the No. 2 seam when I learned

A number of the boys, however, kept their heads and came with me. We got out of the fiery entry as soon as possible and got into a chamber several hundred feet long, and free from smoke. Every one of us had has dinner pail. Some of the men picked up the pails of those who had dropped them in their mad flight for safety. In these were only scraps of bread and meat. We realized that we must save this food as long as possible. Many of us had been in mine accidents before, where little pieces of bread and a scrap of meat meant life.

"After we got in the chamber, we decided that the best thing to do was to wall up the entrance in order to prevent the gases from coming in. In a little time we had the chamber completely blocked.

WOMEN HUDDLED TOGETHER AND WAITED FOR NEWS

NEITHER WEATHER NOR DARKNESS COULD DISPERSE THE WIVES AND MOTHERS

AT LAST THE FIRST BODY WAS BROUGHT OUT

OTHER BODIES WERE BROUGHT UP AND COVERED WITH CANVAS

Grave charges flew back and forth; representatives of the Miners Union claimed that the shaft should not have been sealed. They said that there had been no regard for the lives of the miners, but only a desire to save company property. Matters grew worse and State troops were asked for. On Monday, mine superintendent Steele said no men could live longer than two hours after the shafts were sealed. On Tuesday, the 16th, fire chief Horan, of Chicago, arrived with his men. On Wednesday, the 17th, the troops reported at 1 a.m. Feeling was running so high that the coroner's inquests were postponed. Engineers Cowley and Raisbeck were spirited away. On Wednesday rescuers were again

that the mine was on fire. My first action was to try to reach the main shaft. I found this blocked by the fire and already the bodies of many men were on the ground. All of them evidently had been suffocated. I did not try to go farther, something told me that if I attempted to pass the fiery barrier my death was certain. Turning I made my way back to the entrance of the No. 3 seam. I realized the danger of getting mixed up with the smoke. I shouted to the men to warn them of their danger, I even sprang in front of some of them and tried to hold them back. Many of them were crazed with fright and they pushed past me, only to fall when they reached the heavy smoke.

There was nothing further to do so we seated ourselves on lumps of coal to await our rescue or death. A day and night passed, and suddenly we discovered we had no water. This fact almost unnerved the entire crowd, but we set to digging and at last the moisture began to come. It seeped through slowly, but nothing ever gladdened the heart of a man as did that little black ooze that came from the gravel. At times we shouted, vainly hoping that someone would enter the tunnel and give us relief. Finally, we almost lost count of the days and nights, and we had given ourselves up for lost when we heard a sound from afar off. Then our courage returned, for we knew that rescue was

near at hand. We shouted and yelled again, but we did not know whether we were heard. Then came the unsealing, and I lost consciousness. All of the days and nights fell back, and I dropped into a sleep."

The suffering of these miners, as is evidenced from the foregoing statement of one of the survivors, was beyond description. Some of the men ate their leather gloves and hat bands, others the grease from their lamps. Toward the last the bark from the mine props was considered a delicacy. These imprisoned miners burned but one light at a time. The last light gave out at 3 p.m. Tuesday, and this was the last time they looked at their watches. It was about seven days to the hour from the time they were imprisoned in the mine until their rescue was effected.

No More Men Saved

After the discovery of these 20 men, the rescuers worked like fiends in the hope of saving other lives. Extra shifts were put on and the work was continued night and day. The rescuers penetrated further into the workings, but only dead bodies were recovered. At last the No. 3 seam was entered, and it was soon evident that all of the miners in this level had perished. The men were piled in heaps near the foot of the shaft. Rude fans had been constructed in a desperate effort to furnish air. These men on the third level were not discovered until Wednesday, Nov. 24, eleven days after the fire started.

The best evidence at hand showed that these miners lived about 48 hours. Messages were written on the slate, showing that after the fire started, practically all of the men in the No. 3 seam had gathered at the foot of the shaft. The rescuers counted only 68 bodies, showing that the men had split up into parties and had gone to different parts of the seam in search of air and to escape the black-damp. It is probable that all of these men were suffocated by this latter gas.

The figures showing the extent of this latest mine horror are about as follows: Men in mine when fire started, Nov. 13, 527; rescuers burned in cage, 10; dead bodies recovered, 101; bodies in sight in No. 3 seam, 68; escaped and rescued Nov. 13, 124; rescued alive, Nov. 20, 20. This makes the totals as follows: Known dead 179; escaped, 144; total accounted for, 323; unaccounted for, 204; estimated total death list, 393.

It is probable that the foregoing figures will not be changed materially, as the flames became so bad that rescue work was finally abandoned and the mine sealed on Nov. 25. The town of Cherry has now been practically deserted and work temporarily abandoned. The mine may be left closed one week, or several months, according as the officials deem best. No other course was left open to them, and under the circumstances their action seems entirely justified.

Lessons to be Learned

It is to be hoped that the mining industry in America will consider the men sacrificed in the St. Paul mine disaster as martyrs to a cause, and that cause the safeguarding of our mines and the men they contain. The St. Paul mine, as is claimed by many, was a well designed and constructed plant on the surface. Conditions underground, however, could certainly have been improved. When a mine is equipped to get out the maximum tonnage of coal, it is often widely advertised as a modern property, and the idea is conveyed that no accident should have occurred in such a mine. A big steel tipple and a fine power plant on the surface do not necessarily mean superior protection for the men working underground. After an accident of the kind that has occurred

RESCUERS WERE EQUIPPED WITH BREATHING APPARATUS

at the St. Paul mine, it is absurd to claim that the operation was safe, and the safety precautions were adequate. There were two hoses in the stable, but they were certainly not effective. The hay was brought down each day and none was kept underground; however, there was sufficient of this material there to make a furnace of the entry in a very short time. All shots in the mine were supposed to be fired at 11:30 each morning, so it is probable that whatever dust had been raised was quite settled by the time the fire started.

The main criticisms are that fire drills were absent and that the shaft and the bottom near the shaft and about the stable, was far from being fireproof. The accident should impress mining men with the importance of constructing fireproof shafts and landings. It is to be hoped that the St. Paul officials will satisfactorily explain the delay in giving an alarm. The accident has also drawn attention to the rapidity with which mine timbers covered with dry dust will flame and burn.

Many mistakes have been made in this and other mines, and it is certain that in the future many operators who now believe their mines are safe will also have cause for sad disappointment. In coal mining, most of us live in glass houses, so it is dangerous to throw stones. Mine operators must pull together; mine laws must be adequate and then must be strictly observed; the miners' union must learn to pull with, rather than against the operators, and the miners themselves will have to be educated until they are careful of their own and their comrades' lives. Lastly, the public will have to pay a better price for coal so that coal operators can live and make interest on their investment, and at the same time safeguard their men and property.

Coke and Briquets in Great Britian

The quantity of coke produced in Great Britain for the year 1908, now ascertained for the first time, was 18,537,468 long tons; of which 11,213,651 tons were made in coke ovens and 7,323,817 tons at gas works. No comparative figures for 1907 are available. The coal used in making coke was 35,233,523 tons, showing an average consumption of 1.901 tons to the ton of coke. The total number of coke ovens in Great Britain is reported at 26,214, of which 19,478 are beehive ovens. The number of by-product ovens is 6736, of various types; the more important as to number being the Coppee, the Simon-Carves the Otto-Hilgenstock and the Semet-Solvay, in the order named.

The production of briquets in Great Britain in the year 1908 was 1,604,649 long tons. The coal used in making briquets was 1,471,448 tons, showing a consumption of 0.917 ton of coal to the ton of briquets.

Output of Canadian Mines

According to a report from Consul Harry A. Conant, of Windsor, Ontario, the value of the output of mines of Ontario during the first six months of 1909, as given by the Bureau of Mines, amounted to $10,649,923, an increase over the first six months of 1908 of $2,617,659. The shipments from the Cobalt silver mines amounted to 15,360 tons of ore and concentrates, against 9209 tons during the first half of 1908. The increase in the silver contents of the shipments was about 45 per cent. The output of nickel increased about 25 per cent. and that of pig iron about 44 per cent. There was little change in the output of iron ore, and a slight decrease in the output of copper.

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Publicity by Mining Companies

A contemporary, *The African World,* from the other side of the globe voices its approval of a remark that we recently made, viz., that the stockholders of a mining company should have such a frank and honest statement of conditions and prospects as one partner in charge of the operation of a property would make to another who was absent.

We feel that we have already accomplished a good deal in awakening the managers of American mining companies to the recognition that it is only the square thing to their stockholders to communicate promptly to them data about their property. One of the largest and most important of our mining companies, viz., the Goldfield Consolidated, wrote us a few days ago as follows: "Thus far we have avoided the publication of monthly data, but we are happy to say that the view entertained by our board of directors, at their meeting on Nov. 18, was in favor of such a publication."

There is now a rather large list of American mining companies that are publishing monthly reports of progress. These differ in degrees. Some give only the figures of production, others report the result of prospecting and development. The conditions among mining companies are different. All cannot make the same kind of report. The important thing is that stockholders are now being put in the way of obtaining prompt official information as to their interests. In all probability every important public mining company will soon adopt this policy. Of course, there are many close corporations, to all intents and purposes private affairs, that are not to be expected to make public reports, which in their cases are unnecessary.

The Sacrifice of Life in Industry

This is a broad subject, but we here confine ouselves to our specialty—mining. Both in metalliferous and in coal mining the loss of life in the United States is far higher than it should be, far higher than it is in the more enlightened of foreign countries, and that this is so is shameful.

It is not in the spectacular catastrophes that the greatest loss is suffered, but in the little accidents that happen every day and extinguish the lives of one or two men each time. It is, though, the terrible disasters like Monongah, Marianna and Cherry that fix public attention for a while and will eventually correct the injustice to our laboring men.

Anyone can see that if the Cherry mine had had proper escape outlets most of its men would have been saved. The operators of mines must be made by law to provide such means for safety and others that experience has shown to be wise; and there must be adequate inspection to insure enforcement of the law.

This is the first thing to be done. We have passed the time when our operators can consider their responsibility to have ceased in giving the less fortunate who must work with their hands only the right to be killed, and dismissing the widows and orphans with costless sympathy, or a petty donation to pay the funeral expenses.

No one will accuse us of any leaning toward labor unionism. We have practised what we have preached and in this have been no theorist. But we say solemnly that in their propaganda that the sacrifice of life in any industry is an economic charge against that industry Mr. Gompers and Mr. Mitchell are right.

It is cheaper to prevent the loss of life than to pay the bills for disasters however it be done. Almost every great reform has been compulsory. After the victory has been won the very persons regulated have acclaimed the benefits resulting. The interests that now squirm at the idea of effectual legislation and mine inspection will admit the increased economy in their operations after they have been forced to endure it.

The Corporation Tax Law

A pamphlet on the "Corporation Tax Law of 1909" has been extensively circulated. It contains copies of a correspondence between a number of firms representing the American Association of Public Acocuntants on the one hand, and the Attorney-General of the United States on the other. The original object of the correspondence was to secure, if possible, some modification in the requirements of the law in order that the computation of

earnings subject to tax might be made more easily and in accordance with the usual methods of accounting, adopted by railroad, mining and manufacturing corporations at the present time. In this object the correspondence failed and the provisions of the law remained on its passage practically the same as when the bill was first introduced.

For the most part the objections raised by the accountants seem to be reasonable and well founded. The law requires in effect that the earnings of a corporation shall be ascertained by deducting from its actual cash receipts during the year the actual cash disbursements for expenses, interest, etc.; losses actually incurred and a reasonable allowance for depreciation of a plant and property. Now, as the accountants well point out, in the case of a large business the actual cash transactions will not always represent the condition of the business for the specified period. In the long run, of course, and over an extended time, the difference between cash receipts and disbursements will represent the net earnings of a company; but there may be a wide divergency between the cash and the real earnings in any one year. The conditions of a company's business will certainly be better shown by the method outlined in the accountants' letter, which is practically that adopted by all large companies at the present day. That is, the earnings should be the amount accruing during the year whether actually collected in cash or not; the charges the expenses actually incurred and the interest accruing during the year whether actually paid in cash within the year or not. These credits and charges represent the real condition of the business, whether the payment has been deferred—as many must necessarily be—beyond the actual time. It may well be that cash receipts and cash payments may fall due in such a way as to show large discrepancies from the actual state of the business, and very considerable differences between two years when there was really but little divergence.

It would be comparatively easy to bring up examples to illustrate this. We might suppose, for instance, that a large copper-mining and smelting company for some reason or other closed down its mines and works on the last day of the year. Its earnings would promptly cease and determine from that date, but its cash book for the next year would show necessarily a considerable amount of money received and disbursed. The receipts might be in excess, but they could not possibly under any just rule be considered as representing net earnings.

To take another instance; we know of only one case where the report of an important company is made on the cash received and paid basis. That company's annual statement consists of a full account of the cash actually paid and received during its fiscal year. Accepting the figures as correctly given, it is impossible for a stockholder to figure out the actual condition or earnings of the company, except by very careful analysis and comparison, and even then he will not be sure that he is right.

One point which the accountants urge rather strongly is not, we think, well taken, and that is their objection to the requirement that reports must cover the calendar year. It is true that many companies have fiscal years which do not correspond with the calendar year for some reason or other. The railroad companies which report to the Interstate Commerce Commission are required to end their fiscal years on June 30, possibly for the reason that the United States treasury ends its fiscal year on that date, but more likely because reports of that date allow the commission to have its report ready for the meeting of Congress in December. The calendar year is the natural period and the large majority of business men and corporations make their accounts correspond with that period. At any rate, no large concern is going to let its accounts run for a whole year without taking a balance or ascertaining its condition. The statement of earnings and expenses by months is common practice, and where that is adopted there can surely be no difficulty in making reports for a period which shall meet the Government's requirements.

Gold Production in Australasia

The returns of gold production in the States of Australia and the Dominion of New Zealand for the third quarter of the current year show little improvement over those for the first half of the year, and it is apparent that Australasia will show for 1909 a continuation of the decrease which has been going on for three years past. The following table shows the totals for the nine months ended Sept. 30, the small returns from Tasmania and South Australia being estimated. The figures are in fine ounces:

	1908.	1909.	Changes.
West'n Australia	1,235,367	1,196,713	D. 38,654
Victoria.....	483,426	453,660	D. 29,766
Queensland.....	338,053	327,029	D. 11,024
New South Wales	170,296	150,922	D. 19,374
Tasmania.... ...	46,500	44,250	D. 2,250
South Australia..	10,850	9,900	D. 950
Commonwe'lth	2,284,492	2,182,474	D. 102,018
New Zealand....	363,533	348,724	D. 14,809
Total, oz.....	2,648,025	2,531,198	D. 116,827
Total value....	$54,734,677	$52,319,863	D. $2,414,814

The total decrease this year was 4.4 per cent., a slight improvement over the first half, when a decrease of 5.7 per cent. was reported. The larger proportional losses were in New South Wales and Victoria. In New South Wales gold mining seems to be a declining industry in the older districts, while no new ones are brought in to supply deficiencies. Something of the loss also may be due to the diversion of interest and labor to copper mining, which is in much better condition.

In Victoria a general falling off in production from the older districts has been apparent, without any special cause which can be assigned in the case of any one of them. Queensland came near holding its own, the decrease coming chiefly from Mount Morgan. Western Australia did well in the third quarter, reducing the loss shown in the first half of the year by 6294 oz. This was for the most part the result of the working of new districts; the large Kalgoorlie mines showing but little change. In New Zealand the decrease was small and was nearly all in the returns from the dredging industry.

In all the Commonwealth—outside of Western Australia—there seems to be a lack of prospecting. There are no new districts and new enterprises are few. The present apathy may pass over soon, but until it does there will be no revival in the gold-mining industry.

The question of what is "scrap," referred to in the JOURNAL of Nov. 6, seems to be giving rise to some complications in the official mind, as was expected. The Treasury Department, apparently, is not disposed to classify wrought scrap as "junk" and thus let it come in free, which seemed the obvious conclusion. Reluctant to allow anything to go on the free list, if it can possibly be avoided, the department seems to be meditating some legislation on its own account, as in the zinc-ore case. Meantime the importation of scrap is held up, as no one knows what it will cost to bring it in from abroad.

November Dividends

In the accompanying table are shown the amount per share and total amount of the dividends paid during November, 1909, by a number of mining and industrial companies in the United States, Canada, South and Central America.

U. S. Min. and Indust. Cos.	Location.	Amt. per Share.	Amt. Paid.
Amal. Copper, c...	Mont.	$0.50	$769,439
Arizona Copper, c..	Ariz.	0.042	53,839
Boston-Sunshine, g.	Utah	0.02	3,000
Bunker Hill & Sullivan, s.l.....	Ida.	0.15	45,000
Combination Fraction, g.....	Nev.	0.10	92,000
Colorado Gold Dredging, g.....	Colo.	0.25	25,000
Colorado, l.g.s.....	Utah	0.08	80,000
Gold Dollar, g.....	Colo.	0.00½	12,500
Goldfield Con., g...	Nev.	0.20	711,673
Hecla, sl.....	Ida.	0.01	10,000
Homestake, g.....	S.D.	0.30	109,200
Iron Blossom, s.l...	Utah	0.08	80,000
Sioux Con., s.l.g...	Utah	0.03	22,391
Snow Storm, s.l....	Ida.	0.01½	22,500
Uncle Sam, g.s.l...	Utah	0.02	10,000
Yuba, g.....	Cal.	0.12½	300,000
Internat'l Nickel, pf.	N. Y.	1.50	44,563
Lehigh Coal & Nav.	Penn.	2.50	955,650
U. S. Steel, pf.....	U. S.	1.75	6,304,919

Foreign Mining Companies.	Location.	Amt. per Share,	Amt. Paid.
Buffalo Mines, s...	Ont.	$0.03	$27,000
Dolores, g.s.....	Mex.	0.22½	90,000
Le Roi, No. 2, g...	B. C.	0.48	57,600
Lucky Tiger-Com., g	Mex.	0.05	35,750
Mines Co. of Am...	Mex.	0.03	60,000
Panuco.....	Mex.	2.50	25,000
Temiskaming & H. B., s.....	Ont.	3.00	75,000

Chronology of Mining for November, 1909

Nov. 1—Last spike is driven in Western Pacific railway.—Plant of North Ontario Reduction and Refining Company at Sturgeon Falls, Ont., burned.—Twelve men killed in an explosion in the Cambria coal mine at Johnstown, Penn.

Nov. 2—The Saddle Mountain properties and a large interest in the London-Arizona Copper Company in Arizona sold to the Development Company of America.

Nov. 3—Announcement that A. Goerz & Co., of London and South Africa, have purchased control of La Fe property at Zacatecas, Mexico.

Nov. 6—W. A. Clark wins in prolonged suit against the United Verde Company alleging mismanagement, brought by George A. Treadwell.

Nov. 10—A fire at the Great Boulder mines, Perth, West Australia, did damage of over $1,000,000—Nine men killed in mine fire at Auchingloss coal mine, Wilkes-Barre, Penn.—Tipple and power house of Neffs Coal Company at Neffs, Ohio, burned; loss, $125,000.

Nov. 13—Fire in the St. Paul mine at Cherry, Ill., resulting in loss of life of between 200 and 300. After a week 20 men were taken alive from the mine.

Nov. 20—Decision declaring the Standard Oil Company, of New Jersey, a violation of the Sherman law.—The new mining law for Mexico approved by the senate without material change from that passed by the lower house. It will become effective Jan. 1, 1910.

The Goldfield Consolidated Mines Company

In his report to the president, the manager of the Goldfield Consolidated Mines Company, of Nevada, reviews the operations of the mines during the month of October as follows:

During the month of October the total production was 20,137 tons containing $794,421, or an average of $39.45 per ton, of which the whole was milled with an average extraction of $37.28 per ton, or 94.49 per cent. The total net profit was $554,781, or $27.55 per ton. Although the monthly tonnage was less than that of the previous month on account of the loss of the Combination mill, the average grade of the ore and the total profits showed a substantial increase on account of the production of rich ore from development work at the Clermont.

Development—On company account 3743 ft. of development work were done, and 158 ft. by lessees. Developments during the month were unusually successful, especially on the Mohawk 600 and Clermont 750 and 900 levels, and in order to prepare for the increased milling capacity the amount of development work has been greatly increased over that of the previous months.

Operating Costs—The total cost of mining, development, transportation, milling, office and general expense was $6.985 per ton, distributed as shown in the accompanying table. All ore was treated in the new mill. The total cost of operation per ton was raised by a charge for development work of $2.41 per ton, which is greatly in excess of the cost for the previous month on account of an increase of 1303 ft. in the footage driven. A portion of this work for the purpose of recovering the bodies of two miners lost in the cave of the Hampton stope was very expensive; and in addition, all work at the Clermont, including construction in preparation for regular production has been charged to operation. The total cost of production, exclusive of the development work, is only 3.5c. higher than for the previous month, in spite of a smaller tonnage and a larger amount of filling in stopes.

OPERATING COSTS.

Stoping (including a portion of general expense)	$2.56
Transportation	.10
Milling	1.915
Total cost of production	$4.575
Development (including all work at Clermont and a portion of general expense)	2.41
Total cost of operation	$6.985

Combination Mine—The caved Hampton stope is being successfully reopened from both the 230 and 280 levels, and on the latter level medium-grade ore has been followed some distance further south. A portion of the richer ore is also accessible from this level. Conditions in other portions of the mine remain unchanged. The crosscut on the 600 level from the Combination Fraction, which is now out 335 ft., has not yet exposed ore.

Mohawk Mine—The old Kalfus lease workings are being reopened above the 350 level, and good ore is being produced by development work. On the 600-ft. level ore is now exposed in three crosscuts in the footwall of the main oreshoot. All these places have shown irregular seams of free gold and the average production has been of good grade. All the stopes have continued a good production.

Red Top Mine—On the 165-ft. level good ore has been encountered in the south drift, beyond a break, and has been followed 60 ft. farther south. Raises from the north drift have continued in low-grade ore. The north and south drifts on the 260 level have reached the limits of continuous ore so far as known at present. On the 330 level the south drift has alternated between ore and waste, and the north drift has been continued in waste. A large tonnage of good ore was broken in the stopes during the month.

Jumbo Mine—On the 600 level the drift north on the Red Top vein has not encountered commercial ore, although the rock is well mineralized and scattered assays up to $10 per ton have been obtained. On the 750-ft. level the south drift which was on high-grade ore has become poor. Ore averaging $170 per ton is exposed continuously for 220 ft., and the probable length of the oreshoot between the limits exposed is 300 ft. In addition, a drift southeasterly on a cross-vein has exposed good ore for a length of 80 ft. The main south heading has reached a point below the main Mohawk oreshoot on its dip, and a raise and crosscut are being started in search of ore. On the 900 level the north and south drifts have exposed good ore for a length of 320 ft. Both faces are now poor. The main heading on the 1000 level is progressing more rapidly, but has not yet neared the expected ore on this level as indicated by the workings above. During the month of October the Clermont produced 2301 tons of ore from development work containing $225,904, an average of $98 per ton.

Mill Construction—Preparations for the installation of additional machinery at the Consolidated mill are progressing favorably. Foundations are in place for all new equipment except the concentrators and delivery of machinery has commenced. The Combination mill is being dismantled.

The production of mercury at the Almaden mines, Spain, was 1,017,023 kg., or 29,472 flasks in 1908. At Micares it was 50,685 kilograms.

Properties of the American Smelters Securities Company

In connection with the application of the American Smelters Securities Company to list its shares on the New York Stock Exchange, the company has submitted to the listing committee of the exchange a report enumerating the various properties which it holds in fee or controls by stock interest. The company began the conduct of its business on May 1, 1905, and now controls the following properties:

Properties Held in Fee

Dolores, Trinidad and Azul Mining Properties—Situated at Matehuala, Mex., consisting of 151.95 acres. Worked through four mine shafts completely equipped. This property has been worked for a considerable time, and has been and is a large producer and shipper of silicious copper-sulphide ores. The production for the period June 1, 1905, to May 31, 1907, amounted to 116,000 metric tons.

Zaragoza Mine—Situated at Monterey, Mex., consisting of 60 acres. Worked principally through a tunnel 1000 ft. in length. Its production consists of plumbiferous iron ore, zinc sulphide, zinc carbonate and basic copper ores. The production for the period June 1, 1905, to May 31, 1907, amounted to 11,357 metric tons.

Veta Grande Mine—Situated at Parral, Chihuahua, consisting of 57.9 acres. Worked through principal shaft 984 ft. deep, with full equipment. Product consists of silicious silver ores. Production for the period June 1, 1905, to May 31, 1907, amounted to 38,723 metric tons.

Jibosa Mine—Situated at Jiminez, Mex., consisting of 87.103 acres. Three shafts, fully equipped, are used in working the property. Product consists of basic copper sulphide ores. Production for the period June 1, 1905, to May 31, 1907, amounted to 22,436 metric tons.

Bonanza Mining Properties—Situated at Zacatecas, Mex., consisting of 335.27 acres of mining property and 13,000 acres of ranch property. Seven shafts are used in the working and development of the property. Product consists of plumbiferous iron and zinc carbonate ores and of plumbiferous iron slags carrying gold and silver. Production for the period June 1, 1905, to May 31, 1907, amounted to 1918 metric tons of iron and zinc carbonate ores and 7717 metric tons of iron slags.

Tecolotes Mine—Situated at Santa Barbara, Chihuahua, Mex., consisting of 160.25 acres of mining rights and 40 acres of surface rights. The properties are fully equipped and have reached a high state of development. The production of this property includes sulphide smelting ores, carbonate smelting ores and sulphide concentrating ores, all carrying gold, silver, lead and copper. Production for the period June 1, 1905, to May 31, 1907, amounted to 33,414 tons. A concentrator, with a capacity of 5500 metric tons per day, has been constructed to handle the concentrating ores of this property. The cost of this construction was about $150,000.

La Luz and El Angel Mines—Situated at Matehuala, Mex. Are undeveloped properties being prospected with a view to later development.

Everett Plant—Situated at Everett, Wash., consisting of 45 acres, 27.5 acres constituting the smelting works property. This has a water frontage of 180 ft., and the tracks of the Great Northern railway pass alongside the premises.

Subsidiary Companies

The American Smelters Securities Company owns the entire capital stock of the following corporations:

Selby Smelting and Lead Company—Organized under the laws of the State of California, with a capital stock of $600,000, par value $100 per share. This company's smelting plant occupies 185 acres with deep-water facilities at Selby, Contra Costa county, Cal., near Vallejo Junction, on the Southern Pacific railway, about 30 miles from San Francisco. In connection with the smelting plant the company owns 110 acres in the town of Tormez, adjacent to its plant. In addition to refining gold, silver and lead, the Selby company owns and operates a lead-manufacturing plant, producing lead pipe, sheet lead, shot, solder and babbitt metals.

Tacoma Smelting Company—Organized under the laws of the State of Washington, with a capital stock of $500,000, par value $100 per share. Its lead- and copper-smelting plants occupy 52 acres, on deep water, at Tacoma, Wash., and on the tracks of the Northern Pacific Railroad Company. It operates also a copper refinery with a capacity of 1200 tons of copper monthly.

Federal Lead Company—Organized under the laws of the State of Delaware, with a capital stock of $2,000,000, par value $10 per share. The lead-smelting and refining plant is situated at Federal, Ill., near Alton, and comprises 302.5 acres. The plant is a custom smeltery, handling ore from neighboring territory, especially from the Missouri field, and also smelting the ore produced by the company mines. The mining properties consist of about 13,427 acres in the Flat River district in southeastern Missouri. The smelting plant is modern and the mining properties are in a high state of development, fully equipped and producing. The product consists of magnesium-limestone ores carrying lead only. Production for the period June 1, 1905, to May 31, 1907, amounted to 489,972 tons. During the period in question the installation of a 2500-h.p. steam plant and a 2100-ton concentrator have been constructed and are now in operation. It is estimated that the property can produce from 2500 to 3000 tons per diem.

Central Lead Company—Organized under the laws of the State of Missouri, with a capital stock of $1,000,000, par value $100 per share. Situated at Flat River, Mo., consisting of 1603 acres of mining property in the Flat River district. Its ore is of the same character as that of the Federal Lead Company. The production for the period June 1, 1905, to May 31, 1907, amounted to 161,449 tons.

Velardeña Mining and Smelting Company—Organized under the laws of the State of Colorado, with a capital stock of $3,000,000, par value $25 per share. Situated at Velardeña, Durango, Mex., consisting of 2627.7 acres. The ores of this property are various in character. The property has produced at the maximum during the last year as follows: Santa Maria, sulphide shipping ores, 75 tons per diem; Santa Maria sulphide concentrating ores, 150; Terneras, silicious smelting ores, 100; Copper Queen, silicious smelting ores, 400; total, 725. A lead and copper smeltery of a daily capacity of 1000 tons has been completed at a cost of approximately $1,500,000, and is in operation.

Garfield Smelting Company (formerly Silver Lake Mines Company)—Organized under the laws of the State of New Jersey, with a capital stock of $1,000,000, par value $100 per share. Consists of 1506 acres of mining and milling property in the Animas district, San Juan county, Colo. The product consists of silicious concentrating ores carrying gold, silver, lead and copper. Production for the period June 1, 1905, to May 31, 1907, amounted to 70,200 tons. Owing to the destruction of the milling plant at this property by fire early in 1906 the total production of the mines ceased for a considerable portion of the period in question. The 250-ton concentrator now completed cost approximately $100,000.

In addition to the foregoing this company owns about 10,000 acres of land at Garfield, near Salt Lake City, Utah, on which a large copper-smelting plant has been constructed, with a capacity of 2250 tons per day, at a cost approximating $6,000,000 paid for out of cash resources of the company.

Stock Interest in These Companies

The American Smelters Securities Company also owns shares of the capital stock of the following corporations:

Western Mining Company—Organized under the laws of the State of New Jersey, with a capital stock of $1,500,000, par value $100 per share. The total amount of stock issued, par value, is $1,047,875, of which amount the Securities company owns $541,575 par value, being a majority of the capital stock. The property of the company is at Leadville and Lake City, Colo., and consists of 150 acres in fee and 180

acres of leasehold. There are three concentrating mills of 100 tons daily capacity, each, on this property. Its product consists of silver, lead and zinc ores of both shipping and concentrating grades; also iron-oxide ores. Production for the period June 1, 1905, to May 31, 1907, amounted to 432,000 tons.

Dairy Farm Mining Company—Organized under the laws of the State of California, with a capital stock of $200,000, par value $1 per share, of which 142,500 shares have been issued, of which the Securities company owns 96,927 shares. The property consists of 150 acres near Van Trent, Cal. The equipment of the property has cost approximately $75,000. The mine has been developed and shows ore in sight amounting to about 350,000 tons of copper sulphide ores, carrying gold and silver, and about 50,000 tons oxidized cyaniding ores, carrying gold and silver.

First National Copper Company—Organized under the laws of the State of Maine; authorized capital stock, $7,000,000, divided into 1,400,000 shares of the par value of $5 per share; 1,300,000 shares have been issued upon the payment of $2.50 per share, and are assessable at the rate of $2.50 per share. The American Smelting and Refining Company owns 80,000 shares. The 100,000 shares unissued remain in the treasury of the company, exchangeable at $10 per share for $1,000,000 bonds issued against the property of the Balaklala Consolidated Copper Company. The First National Copper Company owns the entire capital stock of the Balaklala Consolidated Copper Company, organized under the laws of the State of Nevada with a capital of $10,000,000, divided into 400,000 shares of the par value of $25 per share, all issued and outstanding.

The property consists of 1149.7 acres in the mineral zone of Shasta county, Cal., and includes tramway right of way, smeltery site and the town of Coram, Cal. A smeltery has been constructed at Coram, 16,000 ft. by aërial tramway from the mine, cost of tramway line being $125,000. The capacity of the smeltery is about 1000 tons per day. The smeltery consists of three blast furnaces and one reverberatory furnace, and has cost approximately $1,000,000. Developments show 700,000 tons actual ore, running 2.6 per cent. copper, and about 400,000 tons of probable ore carrying the same percentage of copper.

Garfield Improvement Company—In connection with the construction of the Garfield plant, heretofore mentioned, and the construction on contiguous property of the plants of the Utah Copper Company and the Boston Consolidated Copper Company, the Garfield Improvement Company was organized for the construction, ownership and management of the town of Garfield, Utah. The Garfield Improvement Company is owned jointly by the Garfield Smelting Company, the Utah Copper Company and the Boston Consolidated Copper Company, the Garfield Smelting Company owning 60 per cent. of the stock. The Improvement company was organized with a capital stock of $200,000, divided into 2000 shares, par value $100 per share, of which the American Smelters Securities Company owns 1200 shares. The company has expended in the purchase of real estate, the construction of hotels, boarding houses, stores, residences, warehouses, etc., approximately $350,000.

Garfield Water Company—In connection with the organization and building of the town of Garfield, the Garfield Water Company was organized to supply water for the township and also for the three concentrating plants of the Garfield Smelting Company, the Utah Copper Company and the Boston Consolidated Copper Company. The capital stock of the Garfield Water Company is $300,000, all issued and outstanding, in 3000 shares of $100 par value per share. The American Smelters Securities Company owns 1000 shares of the stock of the Garfield Water Company. There has been expended in the purchase of springs, real estate and construction something in excess of $500,000.

San Bruno Plant—The Securities company has purchased about 65 acres of land together with water frontage on San Francisco bay at San Bruno point, San Mateo county, Cal., on the Southern Pacific railway, about 18 miles south of San Francisco. The construction of a copper smeltery was begun about two years ago. When completed this smeltery, including the construction of a long pier to navigable water in the bay, will cost about $2,000,000.

Baltimore Copper Smelting and Rolling Company—Organized under the laws of the State of Maryland, capital stock $500,000, divided into 5000 shares of the par value of $100, all issued and outstanding. It owns a valuable and profitable copper-smelting and refining plant and also a copper-rolling plant at Baltimore, Md., free of all liens or encumbrances. The refining plant has a capacity of approximately 200,000,000 pounds of copper per annum.

The New Mining Law for Mexico

SPECIAL CORRESPONDENCE

The new mining law of Mexico was approved by the senate, on Nov. 20, practically as it came from the chamber of deputies and now has the sanction of both branches of congress; the bill, upon the signature of the President, will become a law.

Since the elimination of the proposed Art. No. 144, which prohibited foreigners or foreign companies from denouncing or acquiring mining property in the republic, the law contains no radical changes from the old law of 1892. Its object is mainly to perfect the present actual system and conserve formally and in a clear manner the provisions that practice has found advisable, and which until now have been confined to official circulars.

The reforms of special import are:

1. A complete centralization of the mineral law with the federal authority. With the exception of the fundamental principle wherein mineral property reverts to the nation in case of neglect to pay taxes, and apart from a few dispositions relating to right of way given to mining enterprises in general, the other judicial rights applicable to the industry were consigned, by the old law, to the local code of each state. This has resulted in a diversity of rights to the mine owners according to the state in which the property was situated. With the object to at once unify and federalize the entire industry the new law provides that all mineral questions, not expressed in the mineral code, be subjected to the civil code of the Federal District. Also in the same manner are penal questions relating to the industry subject to the penal code of the Federal District, as supplemental to the mineral law.

2. Holders of registered options on mineral property will be protected. Under the old regulation the promise of sale or option was merely a personal obligation, and not an actual right to dispose of it, i.e., a option could be given on a property, and the property under option could be legally transferred to a third party by the person that gave the option. According to the new law, the mere registration of an option gives the holder actual rights to the property and protects him against interference from all sources, and not solely against the party that signs the option.

3. There is a tendency in the new law to increase the judicial powers of the minister of fomento. The new law concedes to the department to decide in matters of opposition occurring between third parties and the original denouncer, in matters of right of way, in expropriations, of inspection of mines, and suspension of mine work in certain cases of infraction of mineral legislation.

4. The exploration zone is limited in the new law to a circle of 500-m. radius from a point specified in the petition, and the time for exploration is limited to 60 days instead of 90, as in the old law. Exploration rights will not be granted on ground that has been previously worked, and must not be within 200 m. of other mining property.

5. The old law provides that a foreigner who desires to obtain rights on mineral ground within a zone limited to 80 km. or 20 leagues from the frontier, shall secure special permission from the executive of the nation. The new law does not alter this, but also provides that foreigners are prohibited from denouncing or acquiring by any title whatever mineral properties or actual rights over mines within the 80-km. zone. The article does not concede to the executive power to alter its provisions in any case.

Details of Practical Mining

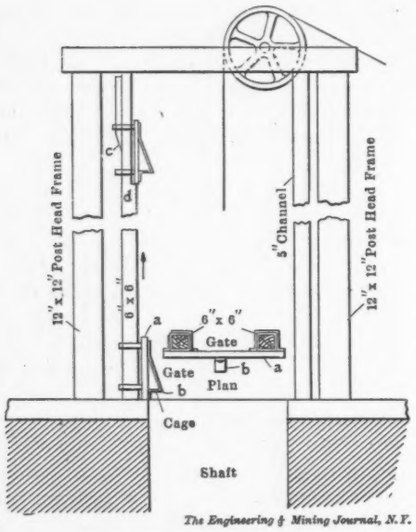
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Shaft Gates

The gates or bars seen at the mouth of many shafts are cumbersome and often quite unsatisfactory. The type shown in the accompanying drawing gives satisfactory results and is of simple and inexpensive design. The gate *a* is built with iron guides as shown in the plan,



OPERATION OF SHAFT GATES

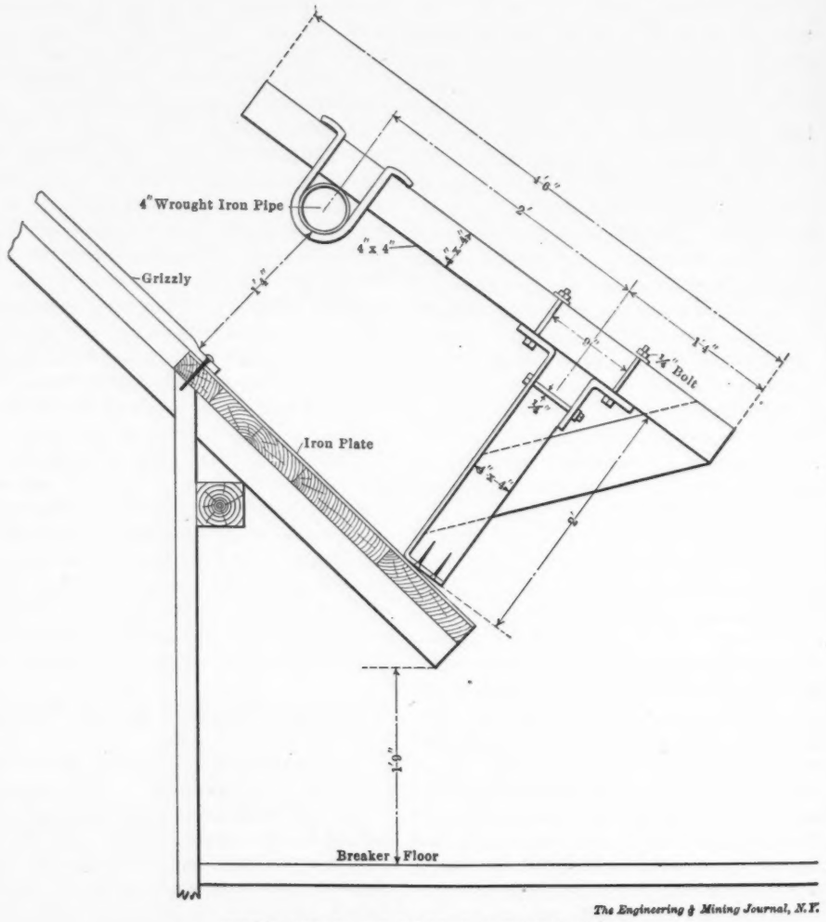
which allow it to travel up and down the guide posts. When the cage comes out of the shaft mouth, it strikes the iron *b* on the back of the gate, lifting it out of the way until the cage is again dropped. In case of overwinding, the gate is diverted by the guide at the point *c*, and swings clear of the cage into the position marked *d* on the drawing.

This same arrangement may be used on both sides of the shaft so that as the loaded car is run off the empty may be run directly upon the cage and lowered, thus saving considerable time. The advantage of these gates raised by the cage lies in the fact that the necessity for a top man to watch the shaft is eliminated, and an additional guard is afforded against danger from persons falling down the shaft, as it is difficult to lift the gates without raising the cage. Where there is little danger of overwinding, the guides for the gates may be made of channel irons or straight posts without the notching shown at *d*. The gate itself may be made of any desired dimensions or construction.

A Finger Chute

BY A. LIVINGSTOKE OKE.*

The accompanying illustration and drawing show an adaptation of the well-known finger chute employed by me, while manager of a mine in Chihuahua, Mexico.



FINGER CHUTE FOR FILLING WHEELBARROWS

At the Polk county mine of the Tennessee Copper Company, the present headframe is to be replaced by a new and larger one practically without interrupting the operation of the mine. The new headframe will be larger in all dimensions than the old one about which it will be built. In the new arrangement the skips will be automatically dumped directly into an ore bin in front of the headframe. During the erection of this bin and the changing of the cables to the new sheaves is expected to be the only time when hoisting will be interrupted.

The ore coming into the breaker floor from an aërial tramway was being dumped direct on a grizzly, the fines going into the battery bin and the oversize accumulating on the floor above, whence it was shoveled into wheelbarrows and taken to the breaker. To avoid the shoveling, the finger chute was put

*Manager of the Argentine and General Exploration Company, Rodeo, San Juan, Argentina.

in and two out of three peons were displaced. The fingers receive very hard usage and should be built very strongly. Their weight keeps the ore back, as, from the position of the fulcrum, they may be considered to have their center of gravity just where it is most effective, i.e., in front of the sliding ore. They are very easily

METHOD OF OPERATING FINGER CHUTE

controlled and saved all the hard work of shoveling. Other types of chute were tried, but failed to be of service.

Treating Concentrates at Lluvia de Oro

Concentrate worth $1000 per ton is reduced to a value of $300 per ton before being packed to the railway from the Lluvia de Oro mine in Chihuahua, Mex., by simply grinding in pans with cyanide and mercury. This is done to remove as much of the free gold from the concentrate as possible, but also to remove a part of the incentive for stealing. Besides the free gold which is caught in the amalgam, most of the gold and silver which dissolves during this grinding in pans is precipitated by, and amalgamates with the mercury, part of the latter going into solution. After the charge is ground fine, the rich solution is decanted and washed from the concentrates as thoroughly as possible and conducted to the zinc boxes where its valuable content is precipitated in the usual way. The ground pulp is conducted over a slime concentrator, reserved for this special material, and thus the concentrate is materially reduced both in bulk and value before shipment on its long journey to the smeltery. The amalgam is reduced to bullion by ordinary methods.

Notes on the Construction and Operation of Stamp Mills*

By G. H. Fison†

Although the power consumption is most economical when the weight of stamp is as great and the drop as low as practice will allow, the duty per stamp controls the operation of a mill, this being adjusted to the capacity of the mill to reduce the ore to the required fineness and expel the pulp through the screen. To maintain a high stamp duty, the speed and hight of drop of stamps must be arranged to give the largest capacity of screen discharge.

At various times efforts have been made to increase the screen discharge by increasing the screen area. Mortar boxes with double discharge have been tried, but usually have not found favor with mill men. One cause for this is that the rear screen is more liable to damage and the consequent loss of time in renewal counterbalances the extra discharge gained. The tables also have to be lowered into a less convenient position in relation to the discharge of the mortar in order to receive the flow from the back of the box. However, if these matters are considered in the original designing of the mill, such difficulties should be easily overcome. In using a back screen a high discharge, 6 in., would be necessary to avoid banking against the bottom edge of the screen under the feed chute.

Vibration Reduces Life of Mills

The life of all stamp mills is materially affected by the vibrations to which they are subjected. These may be minimized by framing timbers carefully and using cushions of gasket rubber under mortar boxes, king-posts and countershaft boxes. The use of concrete mortar-box foundations is another important factor in reducing vibrations in the mill. It is also advisable to carry countershaft bearings on separate concrete blocks and to have the ore-bin foundations built independently of the mill framing. Maintaining the king-post bolts in good order with the nuts tight is also of prime importance. It is therefore evident that these bolts should be placed so as to be accessible and in plain view so that they can be watched continually. It is well to use a heavy yoke with the bolts so as to give a clear hight above the feeder platform and thus make the nuts accessible for heavy spanners. The bolts holding down the mortar box are also important factors in the life of a stamp mill. They should never be placed so as to be masked by mill-water mains or other avoidable obstructions so that they cannot be conveniently reached with heavy wrenches. It is well to have these bolts made in two lengths and joined in the middle with hooked ends. This enables a defective screwed end to be replaced by unhooking the upper half of the bolt without having to dig into the foundation, as is the case when a solid bolt must be removed. Self-locking nuts are reported to be successfully used in a number of mills.

Narrow Mortar Boxes in Favor

The present tendency seems to be to use boxes as narrow as possible with corners rounded in order to avoid waste spaces. With the narrow boxes the inside depth varies from 4 to 9 in., measuring down from the screen opening. The advantage of using a shallow box is that it allows the hight of the discharge to be regulated by chuck blocks, while in deep boxes wear has to be compensated by packing up the dies. Mortar-box liners are made of hard cast iron, mild cast steel or chrome or manganese steel; they should be interlocking and self supporting. They then require but one hardwood wedge to be driven down in either end of the box to hold them tight. A set of interlocking liners can be renewed within 10 min. after the time the dies are removed from the box. Liners should not extend below the level of the false bottom.

Except where inside amalgamation is used the hight of the discharge should be just as short as is consistent with avoiding the banking of sand against the lower edge of the screen, say from 1½ to 2½ in. above the top of the dies, according to the depth of feed employed. The dies should be turned about once in two weeks in order to equalize wear, the highest edge being placed at the back of the box. They

*Abstract of an article in *Min. Journ.*, Sept. 4, 1909.

†Bulawayo, Rhodesia.

should also be proportioned so as to wear out simultaneously. A 7-in. die will usually last as long as a 12-in. shoe. This may in some cases be regulated by using different materials for the die and shoe.

Operation of Stamps

The best results are usually obtained with speeds varying from 95 to 105 drops per min., with corresponding falls of from 8½ to 6 in., varying of course with the type of mill and quality of the ore crushed. In this connection it should be remembered that the effective drop of a stamp is from ½ to 1½ in. less than the hight raised by the cam.

Hardwood guides are reliable and when used with proper care will last for years. In some sections, notably Rhodesia, a grooved cast-iron guide made in halves is coming into favor. The bore is provided with annular grooves to form receptacles for a lubricant consisting of four parts of soft soap to one of graphite. Work is facilitated, when taking up the wear in the guide blocks, by having permanent marks on the king-posts and guide beams to show the exact stem centers. It is very important that these be maintained especially with narrow mortar boxes.

Copper Plates Most Satisfactory

Plain copper plates are preferable to silver-plated ones in that when once set with gold amalgam they will hold a thicker layer of mercury than will the silver-plated ones. It is, however, more difficult to start the amalgamation with the copper plates. When using silver-plated amalgam plates, great care must be exercised in steaming and in scraping or the silver plating will be removed with the amalgam. Hard scraping at any time is liable to injure the plated surface With acid mill water lime should be fed to neutralize the scouring effect. Silver amalgam is sometimes used with success as a first dressing on the bare copper plates, thus enabling a good gold saving to be made from the start and producing a surface more absorbent and sensitive than is that of the silver-plated copper.

Cyanide solutions should not be used in dressing plates unless the greatest care is exercised. Although the plates will be kept bright, gold losses will result and the plates will not be kept in that solid and sticky condition induced by proper scouring and rubbing. Increased absorption of mercury by the gold is caused by raising the temperature of the feed water; when it can be maintained without variation at about 80 deg. F., good results are obtained.

Uniform Water Feed

The water to be supplied a mill is governed more by the flow over the plates than by the conditions in the mortar box. The finer the rock is crushed the more water will be required to keep the plates free from sediment; an excess of water will tend to carry black sand and fine gold away. The best way of introducing water into the mortar is to direct the stream so that it strikes low down the back of the box, and washes over the die with sufficient force to carry fine particles through the screen, but with insufficient force to carry the uncrushed ore from the die. Water with a constant head should be supplied in all cases, and the branch leading to each battery should be fitted with two cocks or valves, one to be used as a regulator and to remain set to pass the required amount of water; the other to be used, whenever the mill is stopped or started, for opening and closing the total supply to the box. A dial may be used with advantage on the first cock so that the exact opening can be observed and maintained.

Use of Mercury Traps and Blankets

No generalization can be made regarding the loss of mercury in amalgamation. Under ordinary conditions, however, with a 7-dwt. plate recovery, the loss, including the process of retorting, should not exceed 1 dwt. of mercury (per ton of ore crushed). Where inside amalgamation is practised the losses in many cases are increased. The use of good traps in the tailings launders aids materially in reducing the quicksilver losses.

In special cases the use of blankets is of undoubted advantage and economy. It is a good scheme to have a blanket mounted on rollers as an endless belt revolving slowly against the stream of pulp; the under side of the blanket passing through a trough of water and being washed automatically, thus saving the dirty and disagreeable work of constant hand washing.

Taking the Wrinkles out of Blueprints

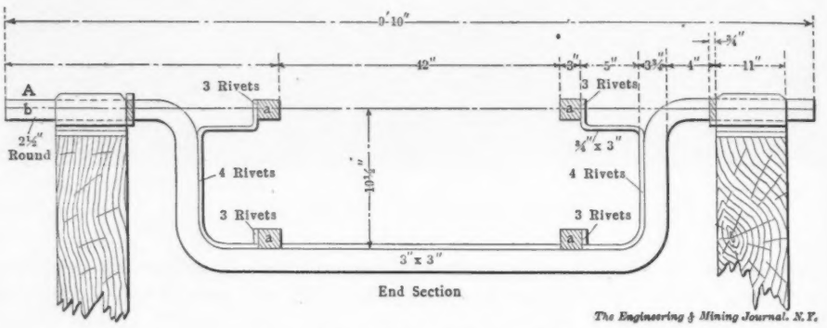
Everyone knows how annoying it is to have blue or other prints roll or curl up when we are referring to them. They are particularly bothersome after being folded or rolled for mailing, especially if not entirely dry when done up.

To save patience, and bad language, J. C. Austin in *Amer. Mach.* Oct. 28, 1909, recommends soaking the prints for a minute or two in a tank of clear, cool water. Then hang by one edge on a line or bar, out of the direct rays of the sun, to dry. If carefully handled they will not be injured a particle by this treatment and will be as flat and smooth when dry as when first made.

Self Acting Tipple

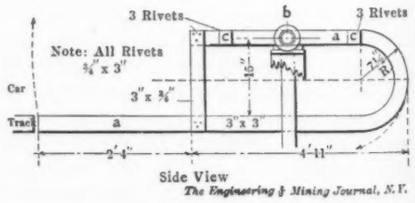
In the accompanying sketch are shown the details of a satisfactory self-acting tipple which was developed in the Birmingham district and is used by the Sulphur Mining and Railroad Company at its mine near Mineral, Louisa county, Virginia.

The loaded ore car is run by gravity on the tipple where the curved 3x3-in. irons *a*



AUTOMATIC TIPPLE WITH SUPPORT

engage the wheels. The tipple is so designed that the weight of the loaded car is sufficient to cause it to rotate about the axis *b*, and hence dump the car. It is also heavy enough to swing back into position after dumping with sufficient



ARRANGEMENT OF TRACK FOR TIPPLE

force to run the car off the tipple and back on the track. A wheel and band brake may be used on axis *b* at *A*, but this is not necessary. This form of tipple is simple in operation, easily constructed and gives good service. At a number of iron mines in Michigan a similar device is used in connection with a tail-rope haulage for returning the empty car, and one attendant takes care of as many as four or five tipples, depending upon the number of bins used.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Charles M. Schwab has been elected a trustee of Lehigh University.

H. Kilburn Scott has left London for Spain on professional business.

J. C. Maben, president of the Sloss-Sheffield Steel and Iron Company, has returned to Birmingham from New York.

Robert B. Brinsmade will spend the next few weeks in Philadelphia, where he is engaged in a metallurgical investigation.

C. Colcock Jones, after several months' absence in Alaska, has reopened his office at 323 Henne building, Los Angeles, California.

Charles H. Bunsen, superintendent of mines for the Inde Gold Mining Company, of Mexico, has gone to San Antonio for his health.

J. P. Hutchins, who has been engaged during the last year in professional work in Siberia, has reached St. Petersburg on his way home.

E. Dwight Kendall and Leo Van Rosenberg, of New York, have recently examined and reported on the Union copper mines in North Carolina.

Charles A. Stillman, for years Birmingham, Ala., representative of Rogers, Brown & Co., has been transferred to Chicago. Mr. Stillman was very popular in the Birmingham district.

C. O. Ellingwood and a party of Eastern men are visiting the properties of the National Development Company in Beaver county, Utah, with Grant Snyder, of Salt Lake City, president of the company.

Mason T. Adams has resigned his position as general manager of the Britannia Mining and Smelting Company, of Britannia Beach, B. C., and has opened an office as mining engineer at 412 McPhee building, Denver, Colorado.

J. Cuthbert Welch, late general superintendent for the Alaska Copper Company and manager for the Cymru Copper Company, Alaska, has been appointed smelter manager for the East Butte Copper Mining Company, Butte, Montana.

J. Earlston Throop, Jr., has been appointed superintendent of the Thomas Iron Company's plant of four blast furnaces at Hokendauqua, Penn. He succeeds Horace Boyd, who has been promoted to the position of general superintendent.

G. W. Metcalfe, formerly acting superintendent at the United States Smelting Company plant at Bingham Junction, Utah, has been appointed manager of the Mammoth Copper Mining Company's smeltery at Kennett, Cal., in place of A. S. Haskell, resigned.

Robert Vaughan, for some time past superintendent of the cyanide plant of the Standard Consolidated Mining Company at Bodie, Cal., resigned Dec. 1 and will go to the Guanajuato Consolidated Company at Guanajuato, Mexico, with which he was formerly connected.

H. E. Urban, of Birmingham, Ala., who has been construction engineer for the steel-plant division of the Tennessee Coal, Iron and Railroad Company, has been appointed chief civil engineer for the company. He will have charge of the construction of the new water works and railroad extensions around Ensley.

The Cambria Steel Company, Johnstown, Penn., has made the following promotions in its official staff: H. C. Walle, formerly assistant to the general manager, to be general superintendent; Daniel M. Stackhouse, superintendent of the open-hearth department, to be assistant general superintendent; C. R. Stuart to be superintendent of the open-hearth department.

Prof. George J. Young, of the Mackay School of Mines, University of Nevada, Reno, Nev., is leaving for a nine months' trip in this country and abroad, during which he will visit many mining districts. Upon completion of his trip he will return to his professorial duties at Reno, where he has been remarkably successful in developing the Mackay School of Mines.

Obituary

Joseph E. Sands died Nov. 19 at Fairmont, W. Va., aged 74 years. He was one of the organizers of the Monongah Coal Company and of the Monongahela River railroad.

Francis L. Stephenson died in Pittsburg, Penn., Nov. 20, aged 64 years. He was a banker and largely interested in coal properties. He was instrumental in the formation of the Monongahela River Consolidated Coal and Coke Company, the Hostetter Connellsville Coke Company and other large companies.

Societies and Technical Schools

Mine Makers' Association—This association, consisting of prominent mineowners in the Cœur d'Alene mining district, will soon cease to exist. The association accomplished much in the way of advertising the district, but since the organization of the Wallace Board of Trade, it has been felt that the Mine-Makers' Association will be unnecessary, since the Board of Trade will promote the same interests.

American Society of Mechanical Engineers—The thirtieth annual meeting of the society will be held in the Engineering Societies Building, New York, Dec. 7-10. The entire social entertainment will be in charge of the members resident in and about New York, under the immediate direction of a local committee appointed by them, of which William D. Hoxio is chairman. For Wednesday afternoon, Dec. 8, an excursion is planned which members and guests will be asked to attend in a body, and during the balance of the time there will be opportunities for smaller parties to visit places of interest. In the evening, there will be a lecture for members and guests upon the subject of Agricultural Machinery. The professional papers assigned to the meeting include studies on gas producers, boiler construction and management, engine efficiency and other interesting topics.

Conference of Indiana Coal Mine Operators—The first step by State Mine Inspector James Epperson to lessen the hazards of mining in Indiana, after his return from Cherry, Ill., was to hold a conference in the Clinton field. Mr. Epperson emphasized the importance of complying more rigidly with the safety laws and especially the provision against "drilling ahead," which is commonly done in Indiana. It was pointed out that disregard of mining laws by both operators and miners has long been the custom in Indiana to such an extent that both agree that the wage contract is a higher law and that working conditions must be incorporated in the wage contract to make it effective. A law was advocated requiring each mine to have two or more distinct openings, so constructed that it would not be necessary that one opening should depend on the other for ventilation. It was also contended that a point of great importance to the industry is to place the responsibility on the mine owner and to make him responsible for the employee under the law.

Coal Mining Institute of America—The winter meeting will be held at Pittsburg, Dec. 16 and 17. Two sessions will be held each day in the School of Mines building of the University of Pittsburg. The first meeting, on Dec. 16, will be the annual business meeting. The following papers are promised:

1. Rescue Station and Safety Measures of the H. C. Frick Coke Company; by C. B. Franks.
2. Mining Laws for the Prevention of Accidents; by John H. Jones.
3. Results of Using Safety Explosives; by J. J. Rutledge.
4. The School of Mines of the University of Pittsburg; by Dr. M. E. Wadsworth.
5. Diamond Mining; by Dr. W. R. Crane.
6. Some Economic Problems Confronting the Coal Mining Industry; by Samuel A. Talyor.
7. The Coal in the First Bituminous Basin in Center and Clearfield counties, Pennsylvania; by R. N. Hosler.
8. Dry Processes of Cleaning Coal; by J. B. McDermott.

There will also be a general discussion on Diminution of Accidents in Coal Mining; led by James Blick.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and Toronto

REVIEWS OF IMPORTANT EVENTS

San Francisco

Nov. 27—The Anti-Débris Association has adopted a resolution asking the co-operation of the California Débris Commission in the matter of the control of dredge mining, and has also given instructions to its attorneys to commence suits against certain dredge owners as soon as additional data can be obtained. It is probable that the dredge operators will welcome the control of the California Débris Commission and subordinate particular methods of operation to a uniform plan embracing all companies. A ruling will have to be obtained from the War Department as to the jurisdiction of the Débris commission, which was organized in connection with hydraulic mining only, and before dredging operations were thought of.

Operations will commence on the new copper mines in San Benito county, across from Soledad, in Monterey county. A leaching plant has been provided. The owners of copper properties in the Spenceville district, Nevada county, are encouraged over the announcement that John Martin will build an electric road through that section during the coming year.

The value of the mineral products of California for the year 1908 is figured by the State Mining Bureau as $66,363,198. The gold output falls several million below that of petroleum for the year. Kern county with its oil has an output valued at over $10,000,000, Shasta with its copper nearly $7,000,000, and Butte with its gold over $3,000,000. According to the U. S. Geological Survey figures the gold output of the State for the year was $18,761,559, which is about $2,000,000 more than in the preceding year.

Denver

Nov. 27—In the Leadville district, much interest is attached to a strike in the old Ella Beeler tunnel, in Iowa gulch. The pay streak is over a foot wide, and the ore runs, it is stated, about $30 per ton. The property is being worked under lease.

In the Cripple Creek district, estimates of the production of the camp from Nov. 1 to Nov. 22, indicated an output of about 45,000 tons of a value of $915,000, or an increase over that of the first 23 days of October. The resumption of shipments by several mines which have been closed down for various reasons, and the lower treatment charges made by the United States Reduction and Refining Company, on half-ounce ore, thus stimulating production of such low-grade ore, are the chief factors in bringing about the satisfactory showing.

Some of the non-producing companies of the Cripple Creek district won a legal victory over the Teller county officials a few days ago when a temporary injunction was allowed, restraining the county treasurer from selling for taxes the properties of the seven or eight plaintiff companies. The case will come to trial the latter part of December, and if the injunction is made permanent, other non-producing companies will then petition to be made co-plaintiffs in the Gould case, as it is known, and thus save themselves from loss of their properties through what is claimed by them to be an unfair and exorbitant rate of taxation.

Considerable activity is reported in the Ten Mile district, near Leadville, most of the work now under way being in the nature of development.

It is reported that shipments of ore to the Salida smeltery have been so heavy during the past two weeks as to necessitate a material increase in the working force.

Salt Lake City

Nov. 27—It is authoritatively, though unofficially announced that arrangements have been completed whereby the control of the Boston Consolidated is to pass to the Utah Copper Company on a basis of 2½ shares of the former for 1 of the latter. Just previous to this announcement it became known that Lafayette Hanchett, general manager of the Boston Consolidated, would leave in a few weeks for a year abroad. It is rumored that the Utah Copper has secured an option on the control of the Ohio Copper, and while this is admitted by insiders to be a probable eventuality the rumor cannot be confirmed officially.

The Ohio Copper Company has started up the first 750-ton unit of its 3000-ton mill and is breaking in the machinery ready for the actual treatment of ore, which will begin this week. As soon as this unit is at work on ore the other unit will be started. The mine run of ore will average about 1.75 per cent. copper with some gold and copper, and each unit on a basis of 750 tons per day will yield 7,500,000 pounds of copper per annum.

F. Augustus Heinze has been in Salt Lake City inspecting the Ohio mine and mill and in the Deep Creek section looking over the Western Utah mine in which he is a dominant factor. The contract for smelting of these concentrates has not yet been signed. The American Smelting and Refining Company and the International Smelting and Refining Company are the bidders.

Stock in the South Utah Mines and Smelters is being exchanged for the temporary receipts held by the stockholders of the reorganized Newhouse Mines and Smelters. Samuel Newhouse has declined the presidency of the new company on the ground that he expects to spend the coming year in Europe. He will be represented on the board and his interests conserved by F. A. Schirmer and L. N. Kramer.

The slump of Colorado Mining stock has occasioned wide interest in the local market. The stock which once sold for $8 is now quoted at 74c. The company has been a large dividend payer, but had not kept up its ore reserves, and now admittedly finds its mine nearly depleted, although it still has about 600 ft. of virgin ground in the direction of the Sioux Consolidated. This is one of the Jesse Knight properties. Mr. Knight is quoted as saying: "The experience at the Beck tunnel influenced Colorado. In the Beck tunnel the ore cut off short and the dividends ceased. Some doubtless look for the Colorado to do the same. If the Colorado should be compelled to suspend dividends for awhile I should not lose faith in the property. I still hold my stock which takes in the control of the property, and I do not intend to sell it."

The Homber graphite deposits are being actively developed, at present showing a width of 20 ft. which runs about 90 per cent. Machinery and mining equipment are to be installed and an extensive campaign carried on. The mine is four miles south of Brigham City.

The United States Court is hearing two damage suits against the Boston Consolidated for the death of Seth Taft, a former member of the legislature, and of Clint B. Leigh, a reporter on a Salt Lake paper. The accident occurred in February, 1907, when some runaway cars collided with a visitors' inspection train while they were backing down the grade.

Prof. W. H. Burr, of Columbia University, has taken an option on the control of the Utah Gold and Copper Mines Company from E. E. Richards & Co., of New York. The option runs for 30 days, and engineers are now examining the property. If the control passes a mill of large capacity will be built and a spur 30 miles long will be constructed to connect the mines with the railroad at Modena.

The Silver King Coalition Mines Company is being sued in the United States Court by the Uintah Treasure Hill Min-

ing Company for the alleged illegal extraction of ore from the plaintiff's property by the means of secret workings. The bill filed also asks for an equitable partition of the property held jointly by the two companies.

The Creo Mining and Milling Company has filed papers of incorporation. Capital, $50,000. The company will take over 10 claims in the Clifton mining district, Tooele county. Pleasant Grove is the place of business. A. L. Mecham is president.

Butte

Nov. 27—While no definite information is obtainable it is reported that both the North Butte and Tuolumne companies are making surveys and explorations for the purpose of determining the ownership of the Jessie vein. It is possible that there may be litigation between the companies, but it is not expected.

John Junilla and others have started suit against the Washoe Copper Company to recover $370,000 damages alleged to have been sustained by them by reason of the issuance of an injunction in a case which the latter company brought against them to restrain them from working a claim known as the "Summit Valley District" in Butte.

At the Amalgamated company's Pennsylvania mine the new pump station on the 1800-ft. level has been finished and everything is in readiness for the installation of machinery for the new electric pump. It is understood that a long crosscut will be driven north from the 1800-ft. station to intersect a drift run east from the same company's Mountain View mine. The water from the Pennsylvania will be pumped through this crosscut to the Mountain View and from there through the long drift to the Leonard mine where it will be used in the precipitating tanks. The fire at the East Colusa mine is once more under control, and the stopes which caved a short time ago are being caught up again. This fire was started in some unaccountable manner nearly three years ago, but was soon put under control and remained so until about three months ago when the caving of certain stopes caused it to break out with renewed vigor.

At the Coalition's Rarus mine sinking has been discontinued. The shaft is down 2360 ft., but the station now being cut, and which is 10 ft. above the bottom of the shaft, is known as the 2200-ft. station. At the same company's Tramway mine the shaft is now down 1965 ft., and sinking continues. A station set is being put in for the station which will be known as the 2000-ft. station.

In the case of Gassert vs. Strong *et al.*, the supreme court of the United States has recently dismissed the defendant's appeal taken from the Montana supreme court upon the ground that the Federal supreme court has no jurisdiction of the appeal.

Goldfield

Nov. 25—At the quarterly meeting of the directors of the Goldfield Consolidated Mining Company at Goldfield, Nov. 18, the regular quarterly dividend of 30c. per share was declared payable Jan. 31, 1910, to stockholders of record on Dec. 31, 1909. For the fiscal year ended Oct. 31, it was found the earnings were far in excess of the dividend requirements and it was decided to declare an extra dividend of 20c. per share payable the same as regular dividend. After the payment of these dividends, amounting to $1,780,000, there will still be in the treasury of the company more than $1,000,000.

John H. MacKenzie, who is responsible for the present excellent condition of the mine and mill, resigned the office of general manager of the company, owing to large personal holdings in other sections of the western country, which require his attention. One of the last improvements ordered by Mr. MacKenzie is the increasing of the capacity of the mill, from 650 to about 900 tons per day, by the addition of chilean mills which will materially reduce the work required of the stamps. J. R. Finlay, who has been selected to succeed Mr. MacKenzie, enters upon his duties Jan. 1, 1910. Mr. MacKenzie retains his seat as one of the board of directors, and will also act as the consulting engineer of the company.

H. J. Bryant has returned to Goldfield, after arguing in opposition to the attorneys of the local assayers accused of buying stolen ores. His argument was to support the application recently made for a permanent injunction against the purchasing of ore in any of its many forms without notifying the applicants, the Consolidated, the Florence, and the Combination Fraction. The testimony given before Judge Ferrington was to the effect that practically there could be only one source of high-grade ore in the camp and that was from the hands of persons who came into possession of it in an unlawful manner, by stealing it from the properties of the applicants. One week was given the attorneys for the alleged "high grade" assayers in which to prepare and file a brief, and another week was given the applicants in which to prepare and file an answer to the assayers' brief.

Cobalt

Nov. 27—In view of the slump in the stock of the Crown Reserve and the many rumors circulated that this property was not in as good physical condition as was supposed, it is interesting to note that this property sent out the largest shipment for the week. Regarding this slump, a letter was recently published stating that the manager of the mine had sold out his stock, that work had been stopped on the main vein, and the ore stoped out above the 100-ft. level, and that the ore in the Carson vein was inferior, that the workings on the main vein had been flooded, and that insiders in the company only held 800,000 shares, and did not control. In answer to this Colonel Carson has made reply, stating that these assertions are not true, and referring to the statement that none of the veins from the Kerr Lake property had been cut, states "that we have cut No. 15 vein assaying 4031 oz.; No. 16 assaying 4396 oz.; No. 17 assaying 4336 oz.; No. 18 assaying 8528 oz.; No. 21 assaying 2225 oz.; No. 24 assaying 6480 oz." From statements made by the officials of the mine, it would seem that the mine is in excellent condition, and that shipments on the present showings can be maintained for some time.

The Beaver mine again figures in the shipping list. During the week it shipped a 30-ton car of high-grade ore from the 200-ft. level.

It is believed that the Jacobs vein of the Kerr Lake has been cut on the Hargraves, in a crosscut run from the shaft on the 380-ft. level. Up to date this property has done 500 ft. of drifting and crosscutting. Interest in the Porcupine Lake goldfields is rapidly on the increase, and as soon as the winter trails are in good condition a considerable rush into that section will take place. An area of 150 square miles has been staked. Many claims have been sold, and the new owners are losing no time in sending men to do the assessment. The gold-bearing dike extends from the northwest to the southeast, starting in Mountjoy township, passing through Tisdale, Whitney, and into Shaw township.

Interest is again reviving in the districts outside the Cobalt camp. Mosco Vici, associated with Dr. Milton Hersey, has reported favorably on the Rawhide property, Miller Lake district. A shaft will be sunk.

South Lorrain is attracting attention at the present time in view of the excellent results obtained from the summer's work. The Wetlauffer mine during the week shipped a car of 29 tons of high-grade ore. To date this mine has shipped a total of 108,000 lb. of high-grade ore.

The Nivens interest has been ousted from the control of the Cobalt Central, and control has been acquired by outsiders. No change has been effected in the management at the mine, although it is considered probable. The Cobalt Central has been criticized on account of the vague reports regarding the mine that have been issued. It now develops that the money to build the concentrator was supplied by Nivens & Son, and that the indebtedness amounted at one time to $160,000.

Toronto

Nov. 28—Notwithstanding the increase of the import duties on mica entering the United States, the American demand for Canadian mica has for some time been steadily increasing. There has in consequence been a marked revival in the mica mining industry of eastern Ontario, which

was previously in a languishing condition, and the mica-trimming works at Ottawa are active and increasing their staffs. Many properties in the Gatineau district have changed hands. The demand for mica for insulating purposes in connection with electrical apparatus is bringing into the market much of the small material formerly regarded as of little or no value, which is now compressed into micanite.

H. D. Anderson, managing director of the Associated Portland Cement Manufacturers of London, England, is in Canada studying the cement situation here, with a view to entering the field in opposition to the Canadian cement merger. Mr. Anderson's observations led to the conclusion that Canada presented very favorable opportunities for the English manufacturers, though to compete successfully it might be necessary to establish branch factories in the country. The price of cement has already advanced 15c. per barrel on account of the merger and a further increase is anticipated. The matter is causing considerable agitation among consumers, and has been the subject of comment in the Dominion Parliament when Finance Minister Fielding, in reply to an interrogation, stated that during the session an ammendment to the act respecting combinations to enhance prices would be introduced rendering it more effective. The movement for a merger of the smaller marl-using cement plants of western Ontario is still in progress, but details have not yet been arranged.

Mexico Ciiy

Nov. 26—The Pachuca, Zimapan & Hidalgo railway reports the construction of the line as far as Actopan, head of the district of that name, and the first large town on the road from Pachuca to the interior. Construction work is being pushed through to the Zimapan mining district as fast as possible. Thomas Solomon is the engineer in charge.

The Mexican Pacific Company, a plantation company, of Seattle, Wash., has started construction on a railway from Acapulco to Zihuatanejo, two ports along the Pacific coast in Guerrero. Construction was begun from the Acapulco end, and the line, which will be 100 miles long, is to be completed in two years. The grading will be along the coast plain and no difficult engineering problems will be encountered. The material for a part of the road is already in Acapulco, as it was purchased from the Mitchell Mining Company, its project to build from Acapulco to the mines at La Dicha having been abandoned two years ago.

The Virginia & Mexico corporation has made its initial clean-up from a run of 1200 tons of ore netting $7000 in concentrates and $7000 in bullion. The mill has 100 tons capacity, and cost, together with other buildings, $150,000. The property is one of the typical Hostotipaquillo silver deposits with low gold content. It was purchased from a Mexican in 1907 under the name of the Cabrera-America group. These properties have a famous past, some 50,000,000 pesos being claimed to their credit in production. This is only the beginning of milling operations in the Hostotipaquillo district of Jalisco and within a few months several other mills will start operating. The result from the Virginia & Mexico plant is particularly encouraging as between 85 and 90 per cent. saving was made in this, the first run, and there has been considerable interest on the part of engineers to see just what could be saved on these Hostotipaquillo ores. The ores of the Cabrera are not so difficult as most others of the district which are accompanied by high percentages of manganese oxide; nevertheless, a saving of even 85 per cent. on the initial run was a surprise to those who are familiar with the camp.

At Los Ocotes mine, near Ejutla, Oaxaca, a 30-m. shaft has been sunk near the north bank of the Lachigocha river toward the south end of the Teziutlan company's property. Crosscuts at the bottom showed the vein to be in the hanging-wall, the eastern crosscut having cut the vein 1 m. in width. The ore in place runs from 8 to 10 per cent. copper and about 4 kg. silver. Sorted ore of 18 per cent. copper was obtained showing heavy bands of ruby silver. This discovery proves the continuation of the vein for a distance of about 500 m. south of the San Juan shaft. Developments to the north of Dolores shaft extend nearly to the Coapam river, so that roughly 800 m. of the vein are under development. The average width of the vein at 30 m. depth in the San Juan shaft was no more than 1 m., so the vein conditions seem fairly constant, and very little work at the point of recent discovery should add from 25,000 to 30,000 tons to the estimated ore reserves. The effect which this discovery has made on the future possibilities of the Ocotes mine is realized by the local management, who have denounced additional claims in the southern extension.

Paris

Nov. 25—The national federation of miners, wishing to increase its membership will in a short time constitute itself a federation of underground workmen. A plan of this new organization will be drafted in connection with delegates of the federation of slaters, who as underground workers are qualified to form part of this new federation. This will take place after the joint assembly to be held at Albi, at the beginning of 1910. At this meeting will be discussed all questions interesting to both unions.

The Turkish agricultural, mining and forest department will grant on Dec. 27, 1909, at Constantinople, concessions for working phosphate deposits in Caza de Salt. The contractor is bound to build a harbar at Haïfa and to construct a railroad of 40 km. to connect the city of Salt to the main road of Hadjaz.

The Kilo mines, property of the Congo Belgium Colony, has increased its monthly production and the returns of the last months show an increase up to 80 kg. The management foresees a monthly production of 60 to 75 kg. The estimates of the Colony's budget call for a production of 70 km. per month and the income thereof to 2,520,000f. against 1,224,000f. the preceding year.

The Société Calédonienne des Mines is putting up a copper-smelting plant at Dilah Point, near Pam, New Caledonia. The installation includes a water-jacket furnace, 36x120 in. The ore of the Pilow mine will be smelted, after hand sorting. The sulphide ores average 7 per cent. copper, giving after sorting 10 per cent. The equipment was obtained from Fraser & Chalmers, of London and Paris. The company is to begin smelting in May, 1910.

At the department of public works in Paris an international commission for the regulation of mining interests in Morocco held a meeting on Nov. 3, the examination of the rules and regulations reported by a French engineer, Mr. Porché. The results will be submitted to the approval of the diplomatic corps at Tangier. The Algeciras act stipulates that no mining concessions will be granted in Morocco before the enactment of the above mentioned regulations.

London

Nov. 23—In addition to the reversal of the decision of the court of appeal regarding the Elmore patent of 1901, noted elsewhere in the JOURNAL, another case of interest to the mining industry has recently been decided in the courts. It is one in which a legal decision was required as to whether sandstone is a mineral. It was somewhat similar to a recent case where china clay was the doubtful mineral. In the present case, that of the North British Railway Company vs. Budhill Coal and Sandstone Company and others, the plaintiffs claimed that the owners of the land, who had sold it to the railway company reserving "any mines of coal, ironstone, slate, or other minerals," had no right to include sandstone under "other minerals." The present case was an appeal from the judgment of a lower court which held that sandstone was a mineral under the act by which the railway obtained its land. This decision has now been reversed, it being held that the words "or other minerals" meant exceptional substances and not the ordinary rock of the district. In giving judgment the Lord Chancellor said that the court had to determine what the words "other minerals" meant in the vernacular of the mining world, the commercial world and land owners at the time when the purchase was effected, and whether the particular substance was so regarded as a mineral.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

The Copper River & Northwestern railway, from Cordova to its terminus at the Kennicott mines, will be completed one year hence, according to E. C. Hawkins, vice-president. The mines are 200 miles above Cordova, and at present the road is completed 96 miles.

At the Moonshine Chomley, Ltd., Ketchikan, a vein of silver-lead galena ore was struck at 140 feet.

Operations have been renewed on the Cuprite property, Prince of Wales island, under the management of J. T. Jones.

The Kupreanof Copper Mining and Smelting Company is making plans for a shipment of ore in February, 1910, from Kupreanof island. This company is making preparation for extensive operations. John T. Towers is manager.

Arizona

COCHISE COUNTY

Tombstone Consolidated—The first instalment of the new pumps has been received and they are being lowered to the new station, east of the pump shaft on the 800-ft. level. These pumps are duplicates of those on the 1000-ft. level now under water. They will throw direct to the surface. Owing to the great heat resulting from the sinkers in the pump shaft, and the consequent discomfort and danger to the men in the shaft in charge of the sinkers, Manager W. F. Staunton has made arrangements for lowering the water from the 800- to the 1000-ft. level by compressed air, and a large compressor plant for this purpose has been purchased. When the 1000-ft. level is unwatered, and this will probably not be before some time in January, the large compressor plant referred to will be used in running the drills on the 1000-ft. level. While waiting for the installation of the new pumps to unwater the 1000-ft. level, the company has developed an orebody on the 700-ft. level west of the pump shaft on an anticlinal which parallels the Westside anticlinal, from which formerly was taken $1,000,000 of ore. This orebody is 4 ft. thick, from 8 to 12 ft. wide and averages $45 per ton. The objective point of operations has been the lower workings and in this section as yet no development work has been done.

GRAHAM COUNTY

Gold Belt and Missabe-Morenci—The companies have continued operations under the new management. The Gold Belt mill is nearly completed.

Arizona Copper—An addition to concentrator No. 6 at Morenci is being built.

YUMA COUNTY

Tank Pass Consolidated—This new company, A. T. Pryor, president, will develop copper properties near Salome.

Inland Mining Company—This company is sinking an exploration shaft near the Planet mine, Parker district.

California

AMADOR COUNTY

Amador Queen No. 1—This mine in Hunts gulch near Jackson, has been leased to F. W. Ruhser who will reopen the shaft and prospect on the footwall. The mine has been idle for 12 years and has a 1000-ft. shaft.

CALAVERAS COUNTY

Mountain King—T. G. Lockhart, of Goldfield, Nev., has secured control of this mine at Hodson and will operate it on a large scale.

Utica—The repairs on the Cross shaft have been completed and a full force will be put on at the Stickle, the Stickle mill, the Cross, the Gold Cliff and the Madison mill. Fred J. Martin is superintendent.

EL DORADO COUNTY

Noble Metals—This company has leased from H. A. Redruch the Golden Cup mine at Greenwood and will use the Jory process.

Blue Bird—At this mine, Georgetown, W. H. Newkirk, manager, the mill is ready and work resumed.

Channel—This company is working, at Josephine, the Alaurena and the Tiederman mines.

Lucero—At this mine, Georgetown, a rich body of ore has been struck on the 400 level.

INYO COUNTY

At Burgess, east of Lone Pine, rich ore has been found in the Wells claim by H. C. Parrett, a leaser.

Four Metals—At this property, Cerro Gordo, E. McGrath, superintendent, a spur track will be built to the smeltery and a sampler installed. The power line will be extended to the mine.

KERN COUNTY

In the Soledad district near Mohave, the Desert, Hobson, Camp Bird and Fraction mines have been bonded by J. R. Goldsworthy to the Gilchrist Investment Company of Los Angeles for $70,000.

NEVADA COUNTY

Central Consolidated—At this mine, Banner Mountain, east of Grass Valley, the shaft is down 600 ft.

Blue Lead—This gravel mine at Relief hill has been bonded to J. O. Jones, of Nevada City and a bedrock tunnel will be run.

Brunswick—The electric hoist has been started and a three-compartment shaft is being sunk.

Yuba—At the mine, above Washington, the oreshoot continues to improve and men are at work on the 500-level drifting.

Grover-Murphy—This company at Nevada City will install a compressor and resume work. Harry Gray is manager.

TRINITY COUNTY

About 30 men are at work on the Brown Bear at Deadwood and electric power has been bought to the Lappin mine, owned by the California-Michigan company. At Eastman gulch, near Deadwood, several mines are shipping ore.

YUBA COUNTY

California Mother Lode—The power line for this mine at Indiana ranch has been completed and the centrifugal pumps have been put in place.

Red Cross Gold Mining Company—This company has been organized at Dobbins to work the Red Cross mine. R. E. Brannan, John Cusick and C. E. Swezy are directors.

Colorado

LEADVILLE DISTRICT

The Big Four, on Breece hill, and the Kimberly-Wilfley, on Elk mountain, both formerly heavy producers, are to be reopened. Another old-time producer which is now resuming operations is the Iron Mask. Considerable activity is manifested in the Elk Mountain section, Kokomo, where the Breene property has men cleaning the lower tunnel, and the workings of the Connors-Bonanza group, recently purchased by Colorado Springs men, are being cleaned out and retimbered, under the management of Terrence Connors. Five hundred feet of the Connors tunnel has been put in shape. This tunnel is projected to develop at depth the orebodies of the Kimberly-Wilfley, Silver Chain and other properties in that section.

Kimberly-Wilfley—A receivership action has been commenced in the Wisconsin courts preliminary to a reorganization of the company. A mill costing $200,000 is on the property at Kokomo.

OURAY COUNTY

Mono-Baltic—This company, which

bought the Saratoga mines, near Ironton, is installing a smeltery. E. W. Averill, of Boston, is in charge.

El Mahdi—This property at Ouray, under lease to F. H. Herzinger, has resumed.

Bachelor—Leasers are taking out good ore from this mine.

SAN JUAN DISTRICT

Smuggler Union—The ground above the Bullion tunnel is being worked by lessees, while the ground below is being operated by the company, which is pushing development work. A fine body of ore is ready for stoping. The assays of this orebody prove that the phenomenally long oreshoot of the Smuggler Union vein continues below the Bullion tunnel. The Gold Pioneer company is making preparations to operate on ore from the lease on the Seventy-six claim, when the weather causes them to curtail work on the Smuggler dumps.

Contention—This mine is being operated under lease by Nivala & Kaanta.

Black Bear and Calumet-Telluride—These properties are being worked on a small scale by companies controlled by Finlanders.

Camp Bird—The October crushing was 6894 tons yielding 11,163 oz. of bullion and 670 tons of concentrates. The month's sales were $231,773 and the expenses $56,308 leaving net $175,465. Development work, 753 feet.

TELLER COUNTY—CRIPPLE CREEK

Trilby—The mine is shipping a car a day of 1-oz. ore to the reduction works, and the mill is running successfully on low-grade ore.

Anchoria-Leland—This property is regaining its former prestige from the results of the lessees. Daily shipments are made of $60 ore.

Idaho

COEUR D' ALENE DISTRICT

About 3500 men are employed in the Cœur d' Alene district and the monthly payroll amounts to nearly one-half million dollars.

E. W. Hand, of Spokane recently purchased the Mt. Rose, Maryland, Cœur d' Alene Beauty, Offa, Summit, Snow Line and Cliff claims for $4300 at a sheriff's sale. The claims are 3 miles from Wallace. A company will be organized.

Butte & Coeur d' Alene—A strike is reported on the 200-ft. level of the property near Mullan. The ore is silver-lead but the vein has not been thoroughly explored.

Colusa—The tunnel is now in 175 ft. and a good showing has been made. The property is near Wallace.

Alice—Large bodies of silver-lead ore have been blocked out. Shipments will begin soon.

Monarch—At the mill 2000 tons of ore will be treated daily. The raise from the 900-ft. level has been run 480 ft. disclosing 8 ft. of shipping ore and a large quantity of milling ore.

Hecla—This property, at Burke, has been shipping since June 1, 1909. During the present year there has been distributed $190,000 in dividends.

Rainbow—The lower tunnel at Osbourn, is in 700 ft. and a contract for an additional 100 ft. has been let.

Snowstorm—From the No. 4 tunnel a crosscut is being run to determine the width of the vein recently discovered. The tunnel is in 3296 ft. One hundred and fifty men are employed and shipments are 500 tons daily.

Silver Cliff—The property consists of 20 claims near Lookout and is traversed by four veins. James D. Young, Wallace, is manager.

National—A 4500-ft. tunnel which will give a depth on the orebody of 1600 ft. has been started on the property, east of Mullan.

Illinois

VERMILION COUNTY

The mines and coal lands belonging to the estate of the late Michael Kelly have been transferred to the Bunsen Coal Company, which is controlled by the United States Steel Corporation. The consideration is said to have been over $1,000,000. There are six mines on the tract, but little has been done since Mr. Kelly's death. It is said that work will be resumed at once.

Indiana

DAVIESS COUNTY

A series of meetings is being held in this district by the miners to discuss legislation. The bill that seems to be the bone of contention is the law in regard to shot-firing, and the miners will ask that they be allowed to use dampened slack or mud in preparing the shot. They allege the law is now disregarded in many instances from necessity.

GIBSON COUNTY

A 7-ft. vein of coal of excellent quality at a depth of 632 ft. has been discovered on the Watson farm, northwest of Owensville. The find is due to the drilling of a well for oil. Every test well drilled in this section of Gibson county has revealed the existence of coal.

PIKE COUNTY

Winslow—These mines, five miles southwest of Oakland City, which were abandoned several years ago when the diggers suddenly encountered a limestone ledge, will be reopened. A force of men are at work preparing the mine.

Kansas

Ihlseng-Ping—This mine north of Galena is being developed and the erection of the mills is being done under the charge of A. O. Ihlseng, of Joplin.

Clermont—The mill at this mine on the Falenbach land south of Galena is nearing completion.

Michigan

COPPER

Hancock—No. 2 vertical shaft has encountered No. 3 lode at 2040 ft., and found it containing the same richness shown at other points. This lode was discovered in a crosscut from the 13th level of No. 1 shaft to connect with No. 2. The lode is 15 ft. wide. As the property was originally opened to work the Pewabic-Quincy and the Hancock lodes, the discovery of this additional lode materially aids the prospects. No. 2 shaft will be put down until the Pewabic lode is reached at about 3600 feet.

Allouez—No. 2 shaft is down three levels in the lode and is opening an average grade. In a short time this shaft will be in shape to help out in producing.

Quincy—No. 2 and No. 7 shafts have resumed normal production.

Ojibway—The drift from the 500-ft. level of No. 1 shaft is exposing encouraging ground. The drift from the 800-ft. level of this shaft toward No. 2 has not yet reëntered the copper-bearing ground, although the same level drift from No. 2 shaft is in a good grade of stamp rock. Both shafts are at the 1250-ft. level and sinking has been temporarily suspended.

Keweenaw—The new shaft on the Kearsarge lode has reached 75 ft., and results are encouraging. Operations on the Medora lode have been suspended.

New Arcadian—A second drill has been started 2000 ft. from Portage lake. The first drill continues in operation but has not cut the extension of Baltic formation.

Isle Royale—The Baltic shaft is down 600 ft. and is coming into a change. Production from the old mine continues from the copper-bearing portions of the lode entirely with the result that a smaller tonnage is handled with the same mineral.

North Lake—No. 5 drill hole has finally been established in the lode after difficulty owing to boulders. This drill is being put down to cut the formation exposed in the drill core of No. 4 hole.

Indiana—The drill at the first hole has been moved to No. 3 hole after encountering the eastern sandstone. No. 3 hole is 5000 ft. southwest of No. 1. No. 2 hole at a depth of about 550 ft. encountered an amygdaloid formation, which it has passed through and found it to be 30 ft. wide with a copper-bearing portion of 10 ft. near the footwall. A third drill will soon be in commission.

Lake—Preparations have been about completed for the second shipment of about 160 tons to the Tamarack mill, the rock coming from different openings.

Daily shipments of 100 tons will soon be made.

IRON

Catherine—This local company has begun exploration for iron in the Michigamme district between the Portland and Stewart mines.

Minnesota

Kennedy—The Rogers-Brown Ore Company will install four 150-h.p. boilers and equipment for the second shaft at Cuyuna.

Section 30—It is expected that this famous property near Ely will start shipping next season.

Missouri

JOPLIN ZINC-LEAD DISTRICT

A company of Webb City men have struck a rich prospect in a drill hole on the Richardson land, at Neck City, finding 16 ft. of jack.

The West Joplin district which a year ago had only one or two mills now has 6, all in operation and six more will be built soon. This ore is from 18 to 24 ft. in thickness running from 2½ to 3½ per cent. and making concentrates of 60 per cent. zinc.

Samson—This company has thoroughly drilled the west 40 acres of the tract in the West Joplin sheetground district and found ore in nearly every one of the 12 drill holes. A mill will be built. William Briggle, of Joplin, is superintendent.

Bendalari & Cook—This company has purchased 80 acres of the Luke land on which are the Gibson mine and the Nowata, the richest sheet ground mine in the district at the present time.

Granby—Kenyon brothers, of Nowata, have nearly completed the tailing mill on the old Mascot pile. Foust jigs are being installed.

Montana

BUTTE DISTRICT

Raven—The shaft has been unwatered and drifting on the vein on the lowest level started and sinking will be begun.

Amalgamated—The shaft of the Anaconda company's Right Bower mine is down 600 ft. A connection is being made with the Mountain Chief mine.

North Butte—The shaft is down 2300 ft., the lowest level being the 2200, and the sump extending down 100 ft. below. About 1500 tons of ore is being hoisted daily, and is taken from levels below 1000 feet.

British-Butte—The dredge was shut down several days ago. Whether the shutdown is permanent or not is not known. A drill hole is being driven for exploration purposes, and the work on this continues.

Butte-Balaklava—P. H. Nelson, of Duluth, has succeeded R. B. Dear as president of the company. Regular shipments are being made. The raising of the third compartment in the shaft will be completed within a month.

East Butte—The management plans to put a second furnace in commission at the Pittsmont smelter for the treatment of custom ore.

Tuolumne—The east drift has been run to within 50 ft. of the property's end line and is all in ore.

BROADWATER COUNTY

Keating—Preparations are being made for the installation of a power line from Boulder to the mine near Radersburg. Shipments are being made at the rate of two cars per day.

Black Friday—A recent shipment of 32 tons of ore returned the company $5677.

JEFFERSON COUNTY

Boston & Alta—George Haldron, of New York, has been investigating the title to the Alta mine, near Corbin, in the interest of E. R. Dick, of New York. The title was found to be good and it is likely Mr. Dick will buy a controlling interest in the company and erect a 600-ton concentrator next spring.

Lion Gulch—Operations at the property near Homestake have been discontinued. The shaft has been sunk 400 ft., but no crosscutting done. The reason for the suspension is not known.

FERGUS COUNTY

Cumberland—The boiler has been put in place and the compressor is on the ground. The mill will be completed in January, as planned. A. S. Wright, Maiden, Mont., is manager.

LINCOLN COUNTY

Snowshoe—Operations will be resumed at the property in the Libby district. The mine has been idle for three years, having been closed by a receivership. The shaft is 400 ft. deep and has been kept pumped out.

MADISON COUNTY

Goodrich Gulch—H. Schmidt has discovered a deposit of wolframite on his property. The ore is in streaks of from 12 to 18 in. wide.

Nevada

ESMERALDA COUNTY

Mountain King Group—The U. S. Smelting, Refining and Mining company is negotiating for the purchase of this property, known as the Lucky Boy, from Adams & Miller.

Silver Moon—The shaft on this lease is down 225 ft. and sinking is continued. This adjoins the Hubbare lease. J. R. Woodbridge is president and J. J. McCarthy, manager.

LINCOLN COUNTY

Chief—Hodges, Cook, Floyd and H. W. Rand have secured control of this mine near Panaca and expect to build a mill and cyanide plant immediately.

Little Buck—E. E. Fuller and John Bryden have secured a year's lease on the mine a mile east of Fay. A strong vein is exposed in the mine.

Horseshoe—This mill at Fay, after a short preliminary run is about to be started again to treat principally custom ore. E. E. Fuller is manager.

Ninety-Nine—The shaft at Goodsprings is below 200 ft. in heavy iron formation under which is the copper orebody. Shipments of ore have been made from the 200-ft. level. J. B. Jensen is manager.

Hoosier—Work has been resumed on the lead-zinc ores. J. B. Jensen is manager.

NYE COUNTY—TONOPAH

The value of the production for the week ended Nov. 20 is estimated at $109,625, the tonnage being divided among the various mines as follows: Tonopah, 3100; Montana-Tonopah, 685; McNamara, 350: West End Consolidated, 50; Midway, 200; total, 4385 tons.

McNamara—Shipments will be curtailed from this property in order to carry out a more extensive development in the unexplored territory.

Midway—Owing to the temporary closing of the Belmont mill this company is now shipping to the Western Ore Purchasing Company at Hazen.

Tonopah-Belmont—The surface improvements started recently are completed, and the property will soon be in full running order.

Nevada-Bay State Oil—At 1805 ft., the drill has entered asphaltum and black sulphur, and the manager, J. H. Miller, is confident oil will be struck within a very short distance. The operations are at Blair.

Kendall-Goldfield—The general office of this company has been removed from Tonopah to Goldfield and A. H. Howe has been elected secretary. A statement has been issued showing the company to be $35,494 in debt, and 196,500 shares of stock in the treasury.

Oklahoma

Mission—The mill at this mine will be in operation Jan. 1.

Omaha-Petersburg—The mine at Quapaw is making a good record and running steadily.

Eastment—This company working the White Eagle mine is making the steadiest run in the Quapaw camp and is being worked in a manner similar to that of the mines of southeast Missouri.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for September and the three months of its fiscal year from July 1 to Sept. 30 is as follows:

	September.	Three Mos
Earnings	$2,037,894	$5,415,153
Expenses	2,108,815	5,642,240
Deficit	$ 70,921	$ 227,087

As compared with 1908, the three

months show decreases of $1,175,402 in earnings and $764,840 in expenses; the deficit of $227,087 above comparing with net earnings of $183,475 last year.

South Dakota

Homestake—Owing to trouble with the Western Federation of Miners the mine has closed. Superintendent T. J. Grier recently posted a notice as follows: "Notice is hereby given that the Homestake Mining Company will employ only non-union men after Jan. 1, 1910. The present scale of wages and the eight-hour shift will be maintained. All employees who desire to remain in the company's service must register at the general offices of the company on or before December 15, 1909." Anticipating a strike the management decided to close for an indefinite period. The wage scale was $3.50 per day for eight hours. The union has been recognized at the mine for 30 years although some nonunion men have been employed. About 2500 men were on the roll.

Tennessee

A cave-in and fire is reported at Copperhill in one of the properties of the Tennessee Copper Company. Eight men are imprisoned. Expert relief has been sent from Knoxville and Washington.

Utah

JUAB COUNTY—TINTIC DISTRICT

Lower Mammoth—By drifting east from the shaft on the 1500-ft. level for 225 ft. to the Black Jack line it has been demonstrated that the east fissure of the Lower Mammoth does not turn into the Black Jack ground as has been supposed. The east fissure was encountered at 85 ft. from the shaft and while it is well mineralized it is not commercial ore. This fissure will be prospected from the 1700-, 1800- and 2000-ft. levels. E. C. Coffin is superintendent.

Mammoth—Forty men are employed and two carloads of ore per week are being shipped. Since the new ore was found on the 2100-ft. level enough has been opened up to justify increasing the shipments providing the mine can secure a more favorable smelting contract. Samuel McIntire is manager.

Tintic Combination—After several months' idleness work is to be resumed. The working shaft is down 210 ft. A station will be cut at the 250-ft. level and a drift run out under the mountain which will give a vertical depth of 500 ft. A hoist and compressor will be installed. B. H. Bullock is superintendent.

Opohongo—Copper ore of good grade has been encountered in the drift from the 300-ft. level of the Black Jack ground through which ground the Opohongo has been driving to open up its property at a depth of 700 ft. from surface. As a result of this new strike a tunnel will be started to give still greater depth and after the ore is reached sinking will begin. A hoisting plant will be required. W. H. Hatfield is manager.

Grand Central—The raise from the 2000-ft. level is in ore for 85 ft. and conditions indicate a large orebody. It is expected that the company will be one of the biggest Tintic producers for 1910.

Eagle & Blue Bell—The machinery is now being installed and when completed the shaft will be sunk to the 1100-ft. level.

Tintic Central—A new pump has been installed and sinking operations have been resumed. Two shifts are employed. A. N. Holdaway is superintendent.

Tintic Standard—The shaft has reached 684 ft. At 700 ft. a station will be cut and drifting will be started for the quartz fissure encountered in the shaft above.

Uncle Sam Consolidated—Work has been resumed in old workings closed a year ago on account of lack of power and a streak of high-grade ore 12 in. thick has been encountered.

SALT LAKE COUNTY—BINGHAM DISTRICT

Boston Consolidated—During October the copper production amounted to 1,768,088 lb. and the total average cost of production was a fraction under 10c. The copper from the porpyhry ores was derived at a cost of 9.91c. and from the sulphide ores at a cost of 10.34c. per pound. It is expected that the directors will take early action on increasing the capacity of the mill from 3000 tons to 6000 tons per day.

Ohio Copper—The new 2200-ton concentrator will be put in commission soon. The ore will be brought from the Ohio mine through the Mascotte tunnel 14,000 ft. and then to the mill about 3000 ft. from the tunnel. The transportation problem is thus reduced to the handling of the mill product to the smelter.

Utah Metals—Plans for financing this company, the consolidation of the Bingham Metals and the Bingham Central Standard companies, have been completed and operations will be resumed. The 3000-ft. tunnel from the Tooele side of the range will be driven 8000 ft. more to tap the orebodies in Bingham at 2300-ft. depth which will be the deepest workings in Bingham cañon. The portal of the tunnel will be within easy reach of the International smeltery. The company owns 3000 acres in the Bingham district. W. E. Hubbard is manager.

SALT LAKE COUNTY—COTTONWOOD DISTRICT

Big Mitt—G. S. Holmes has taken an option on the property at the mouth of Little Cottonwood cañon. Present developments consist of a tunnel and a winze 100 ft. deep. A hoist and other machinery will be installed and development started.

Rainbow—A new fissure with a northeasterly strike has been encountered in the tunnel at 270 ft. from the portal. The fissure is 3 ft. wide. The tunnel has attained a vertical depth of 175 ft. When the contact is reached, about 42 ft. ahead, if present promising conditions continue a new tunnel lower down will be driven 1400 ft. to attain a depth of 600 feet.

Columbus Consolidated—The tramway from the mine to Tanner's flat will be placed in commission and the output of the mine increased from 50 to 100 tons per day. A winze from the tunnel level shows 10 ft. of sulphide ore, averaging about 10 per cent. copper. The ore above the tunnel is carbonate.

TOOELE COUNTY

Silver Island Coalition—The first carload shipment of ore from the new strike has been sent to the smeltery. The shipment consists of 900 sacks which will assay about $100 per ton. The shipping point is Wendover on the Western Pacific.

West Virginia

Elkins Coal and Coke Company—This company through its Morgantown office, has placed an order for three 10-ton electric locomotives of the Jeffrey type.

Davis Colliery Company—A block of 100 coke ovens is about to be built at Junior.

Wisconsin

Little Bennie—Robert Young has released this property south of the Fox mine, at Benton.

Hoosier—A 50-ton mill is under construction. J. H. Billingsley, Galena, is manager.

Gribbel—A vein of sheet jack has been developed on the property, adjoining the Stevens and Rose properties at Linden.

Dark Horse—This mine is reported sold to the Optimo Mining Company for $25,000.

Wyoming

ALBANY COUNTY

Rambler—The mine near Centennial is increasing its shipments.

FREMONT COUNTY

Carissa—This gold mine near South Pass has been reopened and mill tests of the ore are being made. C. D. Clark, of Evanston, Wyo., is owner.

LARAMIE COUNTY

Chicago—The first carload of iron ore from this mine at Ironton has been shipped to Pueblo, Colo. A shipment of from 15 to 16 carloads daily is planned for the next year.

PARK COUNTY

Winona—The company is preparing to do extensive work. The tunnel will be enlarged and machinery installed. The property is near Cody.

Canada

BRITISH COLUMBIA

Howe Sound—The Britannia Mining and Smelting Company is exploring the orebodies in its Britannia group, and con-

tinuing experiments in concentrating the highly silicious copper ores. Zinc has been encountered in one of the orebodies, so a roaster, cooler and Wetherill separator are being installed for experimental purposes. In the crusher mill rigid rolls have been substituted for chilean mills and jigging is in Hancock, Hartz and Richards' jigs, the pulp passing to concentrating tables and vanners. R. H. Leach, Britannia Beach, is general manager.

Slocan—Damage done to the Canadian Pacific railway to Sandow, Slocan, having been repaired, shipment of ore over it is again practicable. The Consolidated company's Richmond-Eureka mine, near Sandon, during 17 days to Nov. 13 shipped 14 cars of galena. The Summit, in the same locality, shipped 3 cars of similar ore.

Consolidated—This company recently shipped about 200,000 oz. of refined silver to Ottawa. This brings the total of silver from Trail to the mint up to about 500,000 oz. The company is rebuilding its two 100-ton lead blast furnaces and installing enlarged mechanical charging appliances.

Pioneer Placer Mining Company—This company has been organized by Revelstoke and Cleveland, Ohio, men to work a placer gold lease on French creek, north of Revelstoke. Preparatory operations are to be carried on. Forty years ago French Creek had a mining population of about 7000, and much gold was recovered there—coarse gold with nuggets up to 25 oz. in weight. E. A. Bradley, Revelstoke, is in charge.

Ontario

Reeves-Dobie—About four miles of trenching have been done on this property at Gowganda and three shafts put down, the deepest being down 90 ft. Drifting was started at the 60-ft. level. The company has 35 tons of high-grade ore and a large amount of lower-grade and milling ore all taken out in the course of development.

Otisse—The suit brought by S. Kenyon Stowe, claiming $400,000 from the Otisse Mining Company, of Elk Lake, and its promoters for fraud and breach of contract in failing to carry out an option to transfer the property to him has been dismissed by the court on the ground that Stowe was not ready to pay $10,000 on the option when it was due.

American Eagle—At this mine, three miles west of Elk City, a vein 10 in. wide has been found at 20 ft. Ore is being sacked.

Wetlaufer—A block of silver ore 400 lb. in weight, with a vein width of over 12 in. and carrying silver content exceeding 5000 oz. to the ton, taken from the 140-ft. level of this mine, South Lorain, is on exhibition in Toronto.

Ontario—Cobalt District

Shipments for the week ended Nov. 19 consisted of 552.26 tons from 11 mines, and were as follows: Crown Reserve, 185,605; La Rose, 180,641; Kerr Lake, 120,160; Nipissing, 132,595; McKinley-Darragh, 106,926; Right of Way, 61,503; King Edward, 49,282; Coniagas, 84,905; Buffalo, 52,913; Temiskaming, 60,000; Drummond, 70,000; total, 1,109,530 pounds.

Gillies Limit—A force has been started to work on Lot A54, purchased at the recent sale by Mr. Glidden.

Waldman—This property continues to show up well under development, and it is the intention of the management to put on six drills.

Wyandoh—This property, adjoining the Waldman, has encountered good ore at 9 ft. The vein consists of smaltite rich in silver.

Crown Reserve—The Ross vein, or vein 18, has been encountered at the 200-ft. level, giving the mine another 100 ft. of high-grade ore. While hardly as wide or as rich as on the 100-ft. level, it is about 6 in. in width.

Rochester—The vein recently discovered has been stripped for 125 ft. and found very uniform. A shaft is being put down.

Mexico

Chihuahua

Rio Tinto—The 200-ton smeltery at Tersozas, owned by the Corrigan-McKinney interests, of Cleveland, O., will be doubled in capacity.

Durango

Lustre—This property at Indé is closed pending a reorganization plan of the company, the offices of which is at Pittsburg, Penn.

San Andres de la Sierra—This mine is not being worked at present.

Guerrero

At Taxco, the Peña y Cazadores and the Espiritu Santo properties, A. J. Hunter, in charge, will install concentrating plants. The proposed sale of the former property to an English company was not made.

San Mateo—An option on this mine at Poder de Dios has been given. A large amount of ore is developed and the plan is to erect a concentrating plant.

Jalisco

Amparo—The New Jersey court of chancery has handed down a decision allowing the company its claim to 550,000 shares of its stock, claimed also by the Paxson estate, of Philadelphia. Dividends to the amount of $70,000 have accrued on the stock.

Carrizo Copper—The company has made the final payments on the property near Ayutla. A smelting and concentrating plant is installed and development work is under way. The first month's operation of the smeltery gave 300 tons of matte containing 261,000 lb. of copper. Kent E. Keller, St. Louis, Mo., is manager.

Morelia

Santa Rosa—This quicksilver property near Cuernavaca is installing a 10-ton Scott furnace. Philo Burkholder is manager.

Oaxaca

San Juan—A reorganization has been effected of the San Juan company in the Taviche district, and the new company, of which L. R. Wilfley, George I. Ham and C. A. Hamilton comprise the board, has instituted proceedings for the recovery of the property. The case was reopened by means of an amparo for the immediate possession of the mine and an accounting. The property has been one of the largest producers in the district.

Sinaloa

Guadalupe de los Reyes—The new stamp mill and Butters slime plant is nearly completed.

Sonora

Pacific Smelting and Mining Company—The company is developing the Hechal, Rosamond and Aurora properties in the concession limit on the Yaqui river. The Infanito, a contact deposit in the same region on the Yaqui River railroad, it is expected will supply base ore for the Fundicion smeltery.

Cobre Grande—Final payment has been made on the property to Robert Hilburn. Pumping and hoisting equipment have been ordered.

Yaqui River Mining and Smelting Company—The railroad will be completed to Toledo by Jan. 1, and arrangements are in hand to blow in the smeltery at that time. Custom ores will receive primary attention.

Greene-Cananea—The Elisa tunnel has been driven 1470 ft., nearly half the distance it is to go.

Sante Fé—The inclined shaft will be continued to the 300-ft. level and drifts driven at 200 and 300 ft. to cut cross-fissures. The shaft is now 230 ft., and the drifts at 200-ft. level are about 25 ft. each way in the hanging wall. Greenidge & Lee are the engineers.

Los Pintos—This property has been purchased by Los Angeles men, represented by C. H. Thompson. It consists of 35 pertenencias of ground, a 25-ton mill on the gulf of California, and 16 miles of railway connecting mine and mill.

San Juan—This mine has shipped a car of gold-silver ore to El Paso to find what treatment is required. It is under bond to James Randall.

Moctezuma-Arizpe—A special meeting of stockholders has been called to consider the advisability of increasing the capital from 600,000 shares to 750,000 at $5 per share. The mines are idle on account of funds.

Tepic

Purisima—The mine, in the Tepic district being developed by Arthur F. Flynt is obtaining good results.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Dec. 1—In the East the bituminous-coal trade makes a very fair showing, the chief drawback being the short supply of cars which is referred to elsewhere.

Anthracite is a weather market and business has been good. At a number of the collieries there is still trouble about a short water supply.

In the West reports continue good. Car shortage is being felt to some extent, but the supply is much better than in the East. There is a little improvement in prices at most of the consuming centers, but the gain is comparatively small.

Anthracite Dividends—The Lehigh & Wilkes-Barre Coal Company has declared a dividend of 6½ per cent. for the last fiscal year. This is the first dividend, though the company has been in existence over 30 years. Nearly all the payment goes to the Central Railroad Company of New Jersey, which owns most of the stock.

COAL TRAFFIC NOTES

Coal carried over New England railroads, year 1908, long tons:

	Received		
	At Ports.	Connecting RRs.	Total.
Anthracite	1,307,440	3,512,059	4,819,499
Bituminous	3,650,053	2,482,294	6,132,347
Total commercial	4,957,493	5,994,353	10,951,846
Railroad supply	2,325,000	2,065,000	4,390,000
Total	7,282,493	8,059,353	15,341,846

The railroad supply coal is practically all bituminous coal. The figures are from reports collected by a committee of the Boston Chamber of Commerce.

New York

ANTHRACITE

Dec. 1—The anthracite market shows a fair business, cold weather having started the local dealers into more activity, as their orders come in. Business is steady, supplies being abundant except in the case of pea coal, for which there seems to be a special demand just now.

Schedule prices for large sizes are $4.75 per lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes, quotations are nominally unchanged at $3.10@3.25 for pea; $2.25@2.50 for buckwheat; $1.75@2 for buckwheat No. 2 or rice; $1.35@1.50 for barley; all f.ob. New York harbor. In some cases, however, 10 or 15c. per ton more has been paid for pea coal.

BITUMINOUS

The soft-coal market is in fair condition, with some improvement over the last report. The shipment of coal to Lake ports is about over for the season, leaving more coal free to come to the seaboard. This has not improved the car shortage as yet, and probably will not for two or three weeks to come. Mines are still making a good deal of complaint about failure to receive cars as they need them. Transportation is a little better, coal coming through nearer to schedule time, but there is still room for improvement.

Buying continues good and quite well distributed. There is something of a rush on to the shoalwater ports and this will probably be continued until they are closed by ice. The Sound ports are doing pretty well and New York harbor is buying better than it has for some time.

Prices are firm with a tendency to advance. At least 10c. more will probably have to be paid soon for good steam coal, and perhaps a little more for the higher grades. Prices are a little uncertain yet, however, and depend a good deal upon the buyer and terms of sale. Demand for vessels is better, especially for small boats which can reach the shoalwater ports. Nominal rates continue at 85c. from Philadelphia to Boston, Salem and Portland, and 65c. from New York to points around the Cape; but there is a tendency to ask more. Stormy weather is beginning to be a factor and the loss of several coal-laden barges is reported this week.

Birmingham

Nov. 30—The Alabama coal production continues to improve and more labor is being received in the district and put to work. The Coal and Iron Employment Company is a new concern just organized in the Birmingham district, the object of which is to conduct a general employment bureau for miners, arranging for the labor supply of a number of mining and manufacturing corporations as well as for individuals; and also with labor organizations and employment bureaus of the country to procure employment for laborers in North Alabama and especially in Jefferson county, Alabama.

The coke situation is unchanged, the output not being altogether sufficient to meet demand.

The miners and mine laborers in the Birmingham district will receive an advance of 2½c. per ton on Dec. 1.

Chicago

Nov. 29—The coal market shows no decided change, weather conditions not yet being such as to bring heavy buying of domestic coals. General purchases of steam coals continue heavy and the market is in good condition.

Illinois and Indiana, in car lots, bring $2@3 for lump and egg, $1.75@1.85 for run-of-mine and 95c.@$1.15 for screenings. Fine coals remain relatively weak.

Of the coals from east of Indiana, Hocking shows most strength, with no surplus in this territory and selling at $3.15. Smokeless holds to $3.60@3.80 on lump and $3.05@3.15 on run-of-mine. Gas coals have a light, steady market. Anthracite sales are somewhat light but are well distributed.

Cleveland

Nov. 30—The Lake trade is fast approaching its close. Quite a number of contracts will remain unfilled, as it will be impossible to get the coal shipped. Steam trade continues steady, and domestic business has been started up again by a cold spell.

Middle District coals are quoted at $1.40 for 1¼-in.; $1.15 for ¾-in.; $1.05 for run-of-mine; 70c. for slack; freight to Cleveland, 70c.; No. 8 district, $1.35 for 1¼-in.; $1.05 for ¾-in.; 95c. for run-of-mine; 65c. for slack; freight to Cleveland, 90c. Massillon domestic is $2.95, Cleveland, for lump and washed nut. Pittsburg coal is $2.40 for 1¼-in.; $2.20 for ¾-in.; $2.10 for run-of-mine; $1.65 for slack; all f.o.b. Cleveland.

Indianapolis

Nov. 29—Wage scales affecting approximately 100,000 coal miners in this country are to be fixed at the convention of the Mine Workers of America, which meets in this city in January. It is understood that a general increase in wages will not be asked by the miners, but a readjustment of contracts now in existence will be made.

Coal-trade conditions are unchanged except that the cold spell has started up domestic buying again.

Pittsburg

Nov. 30—Following the steady conditions reported a week ago the local coal market became very irregular and prices this week are off about 10c. from last week on mine-run and lump. The drop is probably due to the release of so much coal on account of the virtual closing of

the Lake season. Slack is unchanged at 60@70c., depending on delivery, while mine-run and nut can be quoted at $1.10; ¾-in. at $1.20 and small lots of domestic coal to retail dealers at $1.40, all at mine.

Connellsville Coke—The deadlock on furnace coke on contract for next year continues. The furnaces appear wholly indifferent, being committed to a policy of waiting and their position is slightly improved, since this week there are some definite quotations of $2.85 on contract for first half, or 5c. lower than a week ago. Prompt furnace coke has been offered at $2.85 without finding takers, and is also quotable 5c. lower than a week ago. Foundry coke is dull and unchanged. The market is quotable at $2.80@2.85 for prompt furnace coke, $2.85@3 for furnace coke on contract; $5@3.25 for prompt foundry coke and $3.25@3.50 for foundry coke for next year.

The *Courier* reports the production of coke in the Connellsville and lower Connellsville region in the week ended Nov. 20, at 412,156 tons, and shipments at 4837 cars to Pittsburg, 8412 cars to points west of Pittsburg and 930 cars to points east of Connellsville, a total of 14,179 cars.

The reports of the *Courier* and of George B. Irvin, secretary of the Coke Producers' Association, for the week ended Nov. 20, show a much wider difference than usual, Mr. Irvin's report showing a production of 448,262 tons, a slight increase over the preceding week. Operators in touch with the situation regard Mr. Irvin's report as clearly the more representative of conditions in this particular instance.

St. Louis

Nov. 29—With all of the early coal stored away and demand from manufacturing interests not as heavy as it should be, the coal man is now left entirely to the mercy of the weather. Outside of a little cold snap the first part of October we have had practically nothing but summer weather up to date. All the yards report that they are at a standstill and the retail demand from the city and the country is unusually light. Another thing which has depressed the local market is that railroads have so restricted their equipment that the coal cannot be shipped to the northern markets. This, of course, throws an extra tonnage on the St. Louis market with disastrous effects. The market for nut coal and screenings is improving considerably and prices are a little better than heretofore. This is due to the falling off in the movement of lump coal.

The car supply has improved a little and the efforts of the railroads to prevent the equipment from being too widely distributed is having a material effect on the situation. However, this comes too late to be of any real benefit on the roads who have put these restrictions into effect. The mines in southern Illinois, with the exception of those on the Chicago & Eastern Illinois, have been very short all week. Those in the central district have had all the cars they could load.

Carterville 6-in. lump or egg is $1.75 per ton mine, or $2.42 St. Louis; No. 1 nut is $1.40 mine or $2.07 St. Louis. On coal that has to be sold locally on account of railroad restrictions, these prices are being shaded at least 25c. per ton. Screenings are now held at 30c: mine, or 97c. per ton St. Louis.

Franklin County 6-in. lump or egg is still being quoted at $2 per ton mine or $2.67 St. Loius; 3-in. nut is bringing $1.50 mine or $2.17 St. Louis.

Mt. Olive, Staunton or Springfield district 6-in. lump is still being held for $1.50 per ton mine or $2.02 St. Louis; 3-in. lump is now $1.25 mine or $1.77 St. Louis. However, the market seems to be weakening as 3-in. nut is being quoted at $1 per ton mine or $1.62 St. Louis.

Standard 6-in. lump is $1.10 per ton mine or $1.62 St. Louis; 2-in. lump is bringing 90@95c. mine or $1.42@1.47 St. Louis. Screenings are 15c. per ton mine or 67c. St. Louis; while 1 to 2-in. nut coal is strong at 50c. mine or $1.02 St. Louis.

The market for washed No. 1 is exceedingly strong while No. 2 is weak; No. 5 is also hard to move and is being practically given away.

The market on anthracite remains unchanged; chestnut is in great demand with none forthcoming, while grate and egg are up to demurrage.

Foreign Coal Trade

French Coal Trade—Imports and exports of fuel in France, nine months ended Sept. 30, metric tons:

	Imports.	Exports.	Excess.
Coal.....	10,976,620	818,810	Imp. 10,157,810
Coke.....	1,383,660	98,800	Imp. 1,284,860
Briquets.....	745,540	97,740	Imp. 647,800
Total.....	13,105,820	1,015,350	Imp. 12,090,470
Total, 1908....	13,770,072	1,035,351	Imp. 12,734,721

Exports this year included 82,680 tons of coal and 45,600 tons of briquets furnished to steamships in foreign trade.

Russian Coal Production—Coal production in European Russia for the half-year ended June 30 is reported as follows, by districts: Donetz, 8,965,855; Dombrowa, 2,740,349; Ural, 403,957; Moscow, 121,289; Caucasus, 19,811; total, 12,251,261 metric tons. The total for the first half of 1908 was 12,146,310 tons; showing an increase this year of 104,951 tons, or 0.9 per cent.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices of coal as follows on Nov. 20: Best Welsh steam, $4.08; seconds, $3.84; thirds, $3.66; dry coals, $3.84; best Monmouthshire, $3.48; seconds, $3.36; best small steam, $2.28; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, for cash in 30 days, less 2½ per cent. discount.

Iron Trade Review

New York, Dec. 1—The iron trade shows little change from our recent reports. So far as naw buying is concerned quiet seems to have settled down on the market and is rather expected to continue until the end of the year. At the same time the receipt of specifications on contracts continues on a large scale and there is no lack of work at mills.

In pig iron there has been little buying, except of basic and foundry in moderate lots to fill up gaps. Buyers think that prices have gone too high; moreover most of them are inclined to hold back until after the turn of the year. Possibly the same view as to prices has been taken by furnaces, as some of them are said to be ready to make concessions for future orders. Southern iron has been quite freely sold at 50c. below the quoted price of $15, Birmingham, for No. 2 foundry.

In finished material the market is also quiet. The demand for bars seems to be fairly well satisfied for the present, and in structural steel there is no large business doing. Plate makers are still taking orders for some good lots. There is rather a scarcity of steel billets, and it is reported that further sales of German basic steel have been made for delivery in the East.

International Rail Syndicate—A London cablegram says: "Dissatisfaction over allotment of orders felt by important British members indicates the possibility of a breakup of the British Rail Association and also of the International Rail Syndicate. The existence of both rail associations is further imperiled by the fact that there is likelihood of important additions to the number of outside makers, especially since open-hearth steel makes less costly the plant investment in rail manufacture. The International Syndicate was established in 1904. The arrangements provide for delimitation of territory and fixing of prices. The combine was renewed for five years in 1907. Serious difficulties that have cropped up from time to time have so far been smoothed over, one of them last year being adjusted by the admission of a Russian works. In the past year British makers have lost orders for 300,000 tons because unable to enter into free competition."

Baltimore

Nov. 30—Imports for the week include 4000 tons spiegeleisen, 2414 tons ferromanganese and 80 tons silicospiegel from Great Britain and Germany; 670 tons manganese ore from Rotterdam and 6700 tons from Bombay, India; 20,050 tons of iron ore from Cuba; 5900 tons cupreous pyrites from Huelva, Spain.

Birmingham

Nov. 29—Some small-lot sales are being made by pig-iron manufacturers in the

South, delivery mostly in the next two months. While $15 per ton, No. 2 foundry, is given out as the quotation, concessions even as large as $1 per ton are heard of. Resale iron is being openly quoted at $14.50 per ton. The make in this section is being kept up at the high mark. Some of the larger consumers throughout the country have been sounding the iron market again recently, but makers do not expect any big buying until after the holidays. The shipments of pig iron are about equal to the make. The brokers who were requested to remove their iron bought several months ago, or stand for storage charges, have moved out a large quantity of iron. Southern furnace companies have quite a bit of iron sold ahead for delivery during the first quarter of 1910.

The machine shops and foundries here are in better shape now than they have been in more than two years with a good line of orders in hand.

Chicago

Nov. 29—The iron market continues quiet, with sales light and prices remaining $19@19.50 for Northern No. 2 and $14.50@15 Birmingham ($18.85@19.35 Chicago) for Southern No. 2. Distribution of the iron being bought is very wide, showing a tendency to buying for the needs of the next three to six months in small quantities. A steady but light market is looked for up to the first of the year. Few buyers are venturing into the third quarter.

In finished materials the iron and steel market is strong. The demand for railroad supplies, structural material and commercial shapes is good. Coke is quiet, inclining to weakness at $5.50 for the best Connellsville.

Cleveland

Nov. 30—The time is approaching for action on ore prices, and some will be taken soon. November shipments hardly came up to 5,000,000 tons, chiefly an account of the accident at the Sault.

Pig Iron—Nothing is doing just now. The market is quiet, but there is no sign of weakness. In the absence of business quotations are nominally unchanged.

Finished Material—Some lines are quiet, but there have been heavy sales of both iron and steel bars. There has also been active demand for spikes and other track material.

Philadelphia

Dec. 1—In pig iron a pre-holiday quiet has settled over this entire territory. Very little buying is reported for the past week and settled feeling prevails among consumers. Some negotiations started some two weeks ago for basic iron have been suspended. It is understood here that efforts to boost prices through speculative efforts will not be tolerated. The market is not weak but it is quiet. No. 2 X foundry is quoted at $19.50 for the best brands; basic at $19; forge at $18. Southern irons are offered at practically the same figures.

Steel Billets—Billets remain strong and a number of orders are now in the hands of makers awaiting acceptance. Prices have not been advanced.

Bars—The bar-iron mills are working to their limit to complete shipments promised before the holidays. Prices remain at the recent high level established. The iron stores of this territory have done a better business this fall than for years.

Sheets—Every kind of sheet is held at the highest prices, and while the past week has not brought in many new orders, office-men report an excellent outlook. Sheet manufacturers are inclined to yield a trifle in favor of large consumers.

Pipes and Tubes—All lines of pipes and tubes are strong in price, with an extraordinary consumption of material.

Plates—The alarm over the probabilities of a further advance in plates is over. It is understood that the raw material will not be permitted to become a football of speculators.

Structural Material—No large orders have been reported. Local requirements are of moderate proportions.

Steel Rails—A small Cuban order will go to an eastern mill. Several orders for export will be taken care of in the next two weeks.

Scrap—Small sales of machinery scrap have been made and offers for railroad scrap are received, although no sales have taken place.

Pittsburg

Nov. 30—The week in the iron and steel trade has shown little in the way of new developments. New business in finished-steel products is light, relative to the previous activity, except that sheets and tinplates have been even more active than formerly since the advances of Nov. 12. Specifications on old contracts continue very good, with customers anxious for deliveries.

Steel-car building operations are about to be increased. The Pressed Steel Car Company and the Standard Steel Car Company will soon be using between 2500 and 3000 tons of plates and shapes daily, all from the Carnegie Steel Company.

The Jones & Laughlin Steel Company will tomorrow, Dec. 1, blow in the first of its new blast furnaces at Aliquippa, and two others will follow at intervals of a month or so. These are 500-ton furnaces, expected to produce 150,000 tons each a year. Ground was broken in 1908, but very little work was done during 1908.

Pig Iron—The Republic Iron and Steel Company has bought 10,000 tons of bessemer from the Bessemer Pig Iron Association at $19, Valley furnace, for first-quarter delivery. Its total purchases on this movement amounts to 75,000 tons, the first purchase having beee about May 20. Sales of 5000 tons at $19, 1000 and 1500 tons at $19 and $19.10 were made, the market being quotable at this range. The event in basic pig iron has been the offering of two speculative lots, one of 15,000 and the other of 3000 to 5000 tons, on the basis of $17, Valley, 25c. below the previous minimum of the market, which had been quotable since early in October. Foundry iron is available at $17, Valley, for early delivery, and at $17.25 for equal deliveries over the first half, both prices being 25c. below the previously quotable market. There is very little demand for pig iron and the market is expected to be more or less uneven all month, as consumers do not care to make commitments just prior to the inventory period. It is recognized that pig iron has already scored a large advance, and has been aided in its upward movement chiefly by the spectacular advance in asking prices for coke and the prospect of an advance in ore. Malleable is quotable at $17.50, and forge at $16@16.50 per ton.

Steel—A few small lots of sheet-bars have been sold for first-quarter delivery at $29.50, f.o.b. Youngstown mill, and it is reported that some odd lots have been sold for the same delivery at $30, f.o.b. Pittsburg mill. Limited tonnages are said to be available at $28.50, f.o.b. maker's mill, Pittsburg district, so that the market is not very clearly defined. Billets are quotable nominally at about $27.50, Pittsburg.

Ferromanganese—The market is strong but not quotably changed, at $45@46 for prompt and $45.50@46 for first quarter, f.o.b. Baltimore, freight to Pittsburg being $1.05 per ton.

Sheets—Demand continues good and mills have no trouble booking all the tonnage they care to acept. A slight weakness in galvanized corrugated sheets has disappeared and the market is absolutely firm. Prices are: Blue annealed sheets, 10 gage, 1.75@1.80c., depending on delivery; black sheets, 28 gage, 2.40c.; galvanized, 3.50c.; corrugated roofing, painted, $1.70, and galvanized, $3 per square.

St. Louis.

Nov. 29—The amount of business closed this week has been light and split up into small lots. The prevailing price is $15@15.25 per ton Birmingham, or $18.75@19 f.o.b. St. Louis for No. 2 foundry iron. While an advance for the second quarter is probable, it is thought that these prices will be good for some time yet.

Iron Ore—Missouri ore is in strong demand at $3.75 per ton f.o.b. St. Louis for 50 per cent. ore. A new washer has just been completed at Greenville, Mo. This is in the Williamville, Greenville and Wayne county district.

Metal Markets

New York, Dec. 1—The metal markets on the whole are improving, though copper has been unsettled and inclined to be irregular. Consumption generally appears to be on a large scale.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Oct. 1909..	$ 9,379,402	$ 7,034,164	Exp. $ 2,245,438
" 1908..	1,952,574	3,785,705	Imp. 1,833,131
Year 1909..	106,652,236	38,139,557	Exp. 68,512,679
" 1908..	70,889,954	42,213,678	" 28,676,276
Silver:			
Oct. 1909..	4,053,745	4,017,884	Exp. 35,861
" 1908..	4,378,015	3,746,863	" 631,652
Year 1909..	47,342,861	37,258,414	" 10,084,447
" 1908..	43,159,395	34,539,067	" 8,620,328

Exports from the port of New York, week ended Nov. 27: Gold, $4,839,200, chiefly to Brazil; silver, $607,375, chiefly to London. Imports: Gold, $128,987; silver, $287,384, from Mexico and South America.

Gold—The price of gold on the open market in London continues at 77s. 9d. per oz. for bars, but 76s. 5½d. per oz. was paid for coin. The Bank of England took most of the gold arriving. In New York a total of $3,000,000 gold was taken for export to South America and $500,000 for Canada.

Platinum—Business continues good. The price remains unchanged, dealers asking $29.50 per oz. for refined platinum and $33.25 for hard metal.

Silver—Silver has shown a slight improvement in price, owing to China operations in a large measure. It is considered that by the time of the Chinese New Year, India will be in possession of the proceeds of an unusually bountiful harvest, and no doubt a fair proportion will be invested in silver. The daily offtake in India for the up-country demand has recently been over 100 bars, which is regarded as an active distribution.

SILVER AND STERLING EXCHANGE

Nov.-Dec.	25	26	27	29	30	1
New York....	....	50¾	50⅞	51	51¼	51⅛
London.....	23¾	23¾	23 7/16	23½	23⅝	23 7/16
Sterling Ex..	....	4.8750	4.8755	4.8760	4.8765	4.8775

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Nov. 18, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 8,350,623	£5,838,600	D. £2,512,023
China.....	516,400	1,829,300	I. 1,312,900
Straits.....	164,885	82,800	D. 82,085
Total.....	£ 9,031,908	£7,750,700	D. £1,281,208

Indian exchange in London, average 16.11d. per rupee.

Copper, Tin, Lead and Zinc

Nov.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
25	.....	.....	58⅝	....	.....	.....	.....
26	13¾ @13⅞	13¼ @13⅜	59⅛	31½	4.37½ @4.40	4.25 @4.27½	6.22½ @6.25
27	13¾ @13⅞	13⅛ @13¾	....	31½	4.37½ @4.40	4.25 @4.27½	6.20 @6.25
29	13¾ @13⅞	13¼ @13¾	58¼	31¼	4.37½ @4.40	4.25 @4.27½	6.17½ @6.22½
30	13¾ @13½	13 @13¾	58⅜	31⅛	4.37½ @4.40	4.25 @4.27½	6.17½ @6.22½
1	13½ @13½	13 @13¼	58¼	31¼	4.37½ @4.40	4.25 @4.27½	6.17½ @6.22½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market continues quiet and nominal. Manufacturers are busy filling the large orders that were placed last month, but are not buying pending further developments in the much talked of copper combination. On the other hand, producers are not pressing sales, having sold heavily for delivery during the next few months. There has been some pressure to sell on the part of speculators, and in consequence prices have suffered. Some of the producers are holding aloof, quoting nominally at prices materially above what anyone is now willing to pay, while others are meeting the market but making only small sales in the absence of any important demand. Transactions in Lake have been quite insignificant. At the close the market is 13@13¼c. for electrolytic cakes, wirebars and ingots, and for Lake is nominal at 13⅜@13½c. Casting copper is quoted nominally at 13@13¼ cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill. Business is active.

The standard market has remained under pressure of sales for account of speculators who wanted to realize, and has fluctuated within comparatively narrow limits. At the close, the market is somewhat firmer, with spot at £58 5s., and three months at £59 2s. 6d.

Refined and manufactured sorts we quote: English tough, £62 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £73 10s.@£74 10s.

The copper market opened in November on the basis of 12¾@12⅞c. for electrolytic. The project of a copper consolidation was already in the air and this inspired a speculative movement at the very beginning of the month. In the second week this movement gained force and had the natural effect of drawing in manufacturers who were frightened into covering their requirements for a long time ahead, thus transferring a good deal of the accumulated surplus from the refineries to the factory yards. From Nov. 4 to 20 the volume of sales was huge, the market rising to 13⅝c. Then came the Standard Oil decision which caused buyers to hold aloof, waiting to see how far this would affect the plans for the consolidation, and subsequently there was a sagging of the market under speculative offerings upon which there was a desire to realize; while moreover the New York market had of necessity to get again in tune with London. Although the sales for November were almost unparalleled, it will be found that they were to a large extent of speculative character and will result simply in a transferral of stocks. The weakness of the market at the end of the month, when electrolytic closed at 13@13¼c., is merely a reassertion of the still unfavorable statistical position.

Brass Prices—The following figures are announced by leading manufacturers, taking effect Nov. 22: High-sheet brass, 15¼c.; high-brass wire, 15¼c.; high-brass rods, 15¼c.; all per lb., net base. Brazed brass tubes remain at 20⅜c. per lb. net base.

Tin—After the Banka sale had taken place last week, the London market again became very strong. Reports from this side of a very large consumption for the month of November, accompanied by buying orders, helped the advance, and the close is strong at £143 15s. for spot, and £145 10s. for three months, in London, while the New York market for spot tin is quoted at about 31¾ cents.

Lead—There has been a better demand, particularly for Missouri lead, and the market is firmer at 4.25@4.27½c. St. Louis, and 4.37½@4.40c. New York. The nominal price of the American Smelting and Refining Company for desilverized continues to be 4.40c. New York. Southwest Missouri brands of lead have sold at 4.32½c. St. Louis. The London market is lower at £13 for Spanish lead.

Spelter—There is a lull in the demand, and prices have eased off somewhat, St. Louis being quoted at 6.17½@6.22½c., and New York at 6.32½@6.37½ cents.

New York quotations for spelter, Nov. 26, were 6.37½@6.40c.; Nov. 27, 6.35@6.40c.; Nov. 29 to Dec. 1, inclusive, 6.32½@6.37½ cents.

The market abroad is slightly lower, good ordinaries being quoted at £23, and specials at £23 5s.

Other Metals

Antimony—The market continues dull, and is not expected to improve this month. Cookson's is quoted at 8⅜@8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is

unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—Business is slightly less active, but the market continues strong. In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 16s. 3d. asked by jobbers.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, 10 months ended Oct. 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports.	Exports.	Excess.
Copper, long tons	141,985	52,103	Imp. 89,882
Copper, 1908....	143,576	57,150	Imp. 86,426
Tin, long tons....	35,250	35,046	Imp. 204
Tin, 1908.....	39,211	33,764	Imp. 5,447
Lead, long tons..	170,730	38,630	Imp. 132,100
Lead, 1908.....	198,884	42,733	Imp. 156,151
Spelter, l'g tons..	94,213	6,615	Imp. 87,598
Spelter, 1908....	88,226	6,922	Imp. 81,304
Quicksilver, lb...	3,108,571	1,178,137	Imp. 1,930,434
Quicksilver, '08	3,168,186	1,542,250	Imp. 1,625,936
Ores:			
Tin ore and con.	19,547	.....	Imp. 19,547
Tin ore, 1908...	21,724	.....	Imp. 21,744
Pyrites.....	651,272	.....	Imp. 651,222
Pyrites, 1908...	652,241	.....	Imp. 652,217

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Of the imports in 1909 the United States furnished in all 209 tons copper matte, 56,807 tons fine copper and 27,685 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Nov. 27—The base price paid this week for zinc ore was $50@51 per ton. The base price of lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED NOV. 27.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Highland.....	423,000	.....	.....
Platteville.....	407,160	.....	125,100
Mineral Point.....	376,000	.....	.....
Benton.....	307,250	109,680	.....
Galena.....	238,800	.....	.....
Cuba City.....	136,350	141,610	142,720
Days Siding.....	80,200	.....	.....
Montfort.....	64,000	58,000	.....
Rewey	60,000	66,200	.....
Harker.....	.....	117,070	.....
Linden.....	.....	.....	50,850
Total.....	2,092,760	492,560	318,670
Year to Nov. 27.....	125,932,895	8,632,205	14,179,215

In addition to the above there was shipped to the separating plants, Platteville, Galena and Mineral Point, 1,299,170 lb. zinc concentrates.

Joplin, Mo. Nov. 27—The highest price of the week for zinc sulphide ore was $55 the base ranging from $50 to $52.50 per ton of 60 per cent. zinc, for standard grade ores, and a premnum for ores carrying over 4 per cent. of iron. Zinc silicate ore sold from $24 to $34, on a base of $28@30 per ton of 40 per cent. zinc. The average price, all grades, was $48.50. All buyers paid $53 per ton for lead ore. The average price, all grades, was $52.96 per ton.

Failure of the transportation companies to supply cars curtailed the shipment, but enough cars were supplied to ship the week's production, leaving the stock on hand practically unchanged at 6500 tons. Weather conditions are favorable to a large output, but producers find it hard to increase the number of shovelers.

SHIPMENTS, WEEK ENDED NOV. 27.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,332,210	693,5[illegible]0	$103,349
Joplin.....	2,029,290	148,910	57,510
Duenweg.....	588,270	175,740	19,155
Oronogo.....	436,340	113,510	14,269
Aurora.....	622,950	.....	13,884
Alba-Neck.....	492,410	.....	12,802
Granby	820,600	4,400	12,800
Galena.....	371,640	64,090	10,989
Prosperity.....	409,890	5,940	10,606
Spurgeon.....	400,900	60,230	9,685
Carthage.....	285,540	.....	7,423
Quapaw.....	306,220	.....	7,253
Zincite.....	158,420	.....	4,119
Sarcoxie.....	180,430	.....	3,983
Jackson.....	123,310	.....	3,083
Saginaw.....	106,610	11,820	2,560
Seneca.....	.....	51,100	1,353
Peoria.....	60,520	.....	909
Wentworth.....	43,840	.....	658
Totals	10,769,390	1,329,260	$296,390
48 weeks.....	545,767,450	81,275,330	$13,287,421

Zinc value, the week, $261,190; 48 weeks, $11,070,458
Lead value, the week, 35,200; 48 weeks, 2,216,963

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January.....	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February....	36.63	36.94	34.92	34.37	49.72	50.50
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May.....	34.19	40.06	33.39	37.42	56.05	56.59
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July	34.55	43.06	31.67	41.11	59.90	53.74
August.....	36.53	48.25	33.42	44.54	60.34	57.60
September..	37.63	47.70	34.44	44.87	54.59	56.11
October.....	35.95	49.50	33.28	45.75	52.63	55.02
November...	39.13	51.31	35.02	48.29	54.53	53.94
December...	42.75	.....	39.63	.....	49.68	.....
Year.....	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Chemicals

New York, Dec. 1—The general market is more active, and prices are a little unsettled.

Copper Sulphate—The tone of the market is rather firmer and prices have been advanced 5c., present quotations being $4 per 100 lb. for carload lots, and $4.25 per 100 lb. for smaller parcels.

Arsenic—More interest is being shown by buyers, but prices are irregular. Some makers are selling white arsenic as low as 2⅝c. per lb., while up to 2⅞c. per lb. is asked by others.

Nitrate of Soda—The market is firmer than a week ago. Spot nitrate is still sold at 2.07½c. per lb., but futures have recovered and are now held at 2.10c. per lb. for all positions next year.

Mining Stocks

New York, Dec. 1—The general stock markets continue to be disturbed and are as a rule irregular and inclined to weakness. Trading has been on rather a large scale and money has been easier, but these factors do not seem to have had much effect on the situation. Foreign buying has fallen off considerably. The excitement in the copper stocks seems to have passed over for the present, and nearly all of them show declines from the recent high levels.

An unusual business was done during the week in Homestake of South Dakota. The price went off from $76.50 to $73.25 per share on sales of 1065 shares. This is due to the reports of the strike of miners and the closing down of the mine.

On the Curb copper stocks were weak and nearly all the issues traded in show declining quotations. This was the result of unfavorable reports as to the proposed merger. The volume of business was quite large, but this did not support the market, and the close shows general weakness. The Nevada gold stocks were rather neglected. Cobalt shares are weak and heavy, and buyers seem reluctant to step in even at a lower range of prices.

Boston, Nov. 30—Plenty of excitement has been furnished in the local copper-share market the past week. The reported hitches in the proposed copper merger brought severe declines in the stocks mentioned as likely to go into the combine, while some of the Lake Superior issues have indulged in a runaway market. Boston Consolidated rose $4.37½ to $22.25 on the reports that a consolidation would be effected with the Utah Copper on a basis of 2½ shares of Boston for one of Utah Copper. Stock of the latter company rose to $63.37½ but subsequently broke to $57.25, while Boston fell to $18 from its high.

Lake Copper has been sensational in its flights. On Monday it had an extreme rise from $52 to $63 per share. The following day it broke to $55.50 from which it recovered to $62.75 in a few hours. For the week the stock has risen a total of $17. An extended short interest has been responsible for this sharp advance.

Hancock Mining and St. Mary's Mineral Land have both had marked advances.

Dividend announcements during the week were $8 quarterly by Calumet &

Hecla; $1 quarterly by Copper Range Consolidated; $1 quarterly by Old Dominion of New Jersey; $1.25 by Tennessee Copper; 50c. quarterly by Utah Copper; and 2 per cent. quarterly by Yukon Gold.

Curb trading has been influenced by the big market. Calaveras Copper was put on the Curb list Saturday at $5, but the price slipped off to $4 per share.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I.	112,135,200	51,862,624	38,499,797
II.	103,700,817	43,578,118	30,968,496
III.	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V.	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	.....	.....	.....
XII	.....	.....	.....

VISIBLE STOCKS.

	United States.	Europe.	Total.
I.	122,357,266	124,716,480	247,073,746
II.	144,130,045	118,574,400	262,704,445
III.	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V.	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	.....	236,857,600	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York. 1908.	New York. 1909.	London. 1908.	London. 1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	.....	22.493	....
Total	52.864	.....	24.402	...

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

Month.	NEW YORK. Electrolytic 1908.	Electrolytic 1909.	Lake. 1908.	Lake. 1909.	LONDON. 1908.	LONDON. 1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.198
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.56½	12.928	12.93⅞	58.331	57.363
May	12.598	12.893	12.788	13.238	57.387	59.338
June	12.675	13.214	12.877	13.548	57.842	59.627
July	12.702	12.880	12.933	13.363	57.989	58.556
August	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October	13.354	12.700	13.646	13.030	60.139	57.551
November	14.130	13.125	14.386	13.354	63.417	58.917
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	....
			Av. year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York. 1908	New York. 1909.	St. Louis 1909.	London. 1908.	London. 1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	.....	.....	13.166	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York. 1908.	New York. 1909.	St. Louis. 1908.	St. Louis. 1909.	London. 1908.	London. 1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

NEW YORK Dec. 1 — Name of Comp.	Clg.	BOSTON Dec. 1 — Name of Comp.	Clg.
Amalgamated	85¼	Adventure	6
Anaconda	47½	Allouez	57
Balaklala	‡2¼	Am. Zinc	35
Braden	4⅜	Arcadian	5
British Col. Cop.	7	Arizona Com.	44
Buffalo Mines	3½	Atlantic	11
Butte Coalition	28	Boston Con.	18¾
Colonial Silver	½	Calumet & Ariz.	103
Combination Fra.	.61	Calumet & Hecla.	‡680
Con. Ariz. Sm.	1⅝	Centennial	37½
Cum. Ely Mining.	8¼	Copper Range	82
Davis-Daly	5½	Daly-West	8¼
Dominion Cop.	7	East Butte	11⅞
El Rayo	2½	Franklin	16¼
Florence	2⅞	Greene—Can	11⅛
Foster Cobalt	‡.32	Hancock	21¼
Furnace Creek	‡.05	Isle Royal	25
Giroux	10¼	Keweenaw	3¾
Gold Hill	2	La Salle	16
Goldfield Con.	8	Mass	6
Granby	‡101	Michigan	6½
Guanajuato	2	Mohawk	61½
Guggen. Exp.	238	Nevada	27
Hanapah	‡15	North Butte	62¼
Kerr Lake	8	Ohio Copper	5⅛
McKinley-Dar.	.84	Ojibway	10
Miami Copper	17½	Old Dominion	.53
Mines Co. of Am.	⅜	Osceola	157½
Montezu. of C. R.	9½	Parrot	28¾
Mont. Sho. C.	1½	Quincy	86
Nev. Utah M. & S.	1⅛	Rhode Island	10½
Newhouse M. & S.	3⅜	Shannon	15¾
Nipissing Mines	10¾	Superior	61½
Old Hundred	⅜	Superior & Bost.	14
Pacific Sm. & M.	1¾	Superior & Pitts.	15⅞
Silver Queen	.25	Tamarack	65
Stewart	7/16	Trinity	11
Tennessee Cop'r	37¾	U. S. Smg. & Ref.	53
Tri-Bullion	1⅛	U.S.Sm. & Re., pd.	52½
United Copper	8¾	Utah Con.	44½
Utah Apex	5⅛	Victoria	3½
Utah Copper	58⅜	Winona	8¾
Yukon Gold	5	Wolverine	145
		Wyandotte	2¼

‡Last quotation. ‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.	47
Am. Smelt. & Ref.	96¼
Am.Sm. & Ref., pf.	110
Colo. Fuel & Iron.	48¼
Federal M. & S., pf.	88
National Lead	87
National Lead, pf.	110¾
Pittsburg Coal	26⅜
Republic I. & S.	45
Republic I. & S., pf.	105½
Sloss-Sheffield	86½
Standard Oil	‡674
U. S. Steel	86½
U. S. Steel, pf.	123
Va. Car. Chem.	46¾

BOSTON CURB

	Low.
Ahmeek	215
Chemung	15
Chino	8½
Gila	8¼
Indiana	8¾
Mason Valley	17⅛
Ray Central	2½
Ray Con.	20½
San Antonio	9
Yuma	1¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Nov. 27

N. of Com.	High.	Low.
Adams	.40	30
Am. Nettie	.09	07
Center Cr'k	2.00	1 80
Cent.C.&C.	86.00	85.00
C.C. & C. pf.	85.00	84.00
Cent. Oil	110.00	100 00
Columbia	9.00	7 00
Con. Coal	18.00	17 00
Doe Run	110.00	100 00
Gra. Bimet.	.30	.25
St. Joe	12 50	11 00

LONDON Dec. 1

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 7 3
Esperanza	2 15 6
Tomboy	0 18 9
El Oro	1 5 9
Oroville	0 9 9

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Dec. 1.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Bid.
COMSTOCK STOCKS	
Belcher	1.00
Best & Belcher	.58
Caledonia	.36
Challar	.27
Comstock	‡.33
Con. Cal. & Va.	.89
Crown Point	.95
Exchequer	‡ 43
Gould & Curry	.25
Hale & Norcross.	.48
Mexican	1.35
Ophir	1.55
Overman	.55
Potosi	.56
Savage	.47
Sierra Nevada	51
Union	57
Utah	09
Yellow Jacket	1 00
TONOPAH STOCKS	
Belmont	.62
Extension	.47
Golden Anchor	....
Jim Butler	.10
MacNamara	.27
Midway	.15
Montana	.80
North Star	.02
Tono'h Mine of N.	6.50
West End Con.	.24
GOLDFI'D STOCKS	
Adams	.01
Atlanta	11
Blue Bell	.02
Booth	.09
C.O.D. Con.	.06
Columbia Mt.	.06
Comb. Frac.	.49
Cracker Jack	.01
Dia'dfield B. B. C.	.01
Florence	2.62½
Goldfield Belmont	.04
Goldfield Daisy	.08½
Great Bend	.03
Jumbo Extension	.12
Kendall	.02
Lone Star	.02
May Queen	.04
Oro	.03
Red Hill	.03
Sandstorm	.05

Name of Comp.	Bid.
Silver Pick	.08
St. Ives	.05
Triangle	.01
BULLFROG STOCKS	
Gibraltar	.02
Homestake King	.01
Mont. Shoshone C.	1.37½
Tramp Cons	.04
MISCELLANEOUS	
Cumberland Ely.	8.18¾
Giroux	10.50
Greenwa'r Copper	.07
Nevada Con.	26.87½
Nevada Hills	.70
Nevada Smelting.	.87½
Nevada Wonder	.70
Nevada-Utah	1.12½
Penn-Wyoming	...
Pittsburgh S. Pk.	.64
Ray Central	2.25
Ray Con	20.50
Round Mt. Sphinx	05

COLO. SPRINGS Nov. 30

Name of Comp.	Clg.
Acacia	.07¾
C. C. Con	.02⅞
Doctor	.08
Elkton	.71½
El Paso	.63
Findlay	.10
Gold Dollar	‡.13
Gold Sovereign	‡.04¼
Isabella	.19½
Jack Pot	‡.08
Jennie Sample	.07¾
Jerry Johnson	.08½
Lexington	‡.01¾
Mary McKinney	.49
Old Gold	‡.04
Pharmacist	.03¼
Portland	.83
U. G. M.	.07⅞
Vindicator	.70
Work	‡.06

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Nov. 11	Dec. 7	$0.05
Arcadian Copper, Mich.	.....	Mar. 1	0.50
Camp Bird Min. Co., Colo.	Dec. 13	.....	0.002
Chemung Copper, N. M.	Jan. 1	Jan. 2	1.00
Con. Virginia, Nev.	Dec. 20	Jan. 10	0.25
Crown Point, Nev.	Nov. 30	Dec. 20	0.10
Exchequer, Nev.	Dec. 15	Jan. 5	0.05
Hancock Min., Mich.	.....	Feb. 1	1.00
Mexican, Nev.	Dec. 6	Dec. 29	0.10
Mineral Flat, Colo.	Dec. 11	Jan. 6	0.01
Missoula Copper, Ida.	Oct. 4	Dec. 6	0.01
Mountain Dell Con., Utah	Dec. 21	Jan. 10	0.01
Potosi, Nev.	Nov. 12	Dec. 6	0.10
Seven Troughs Mon., Utah	Nov. 22	Dec. 11	0.00½
Sheridan M. & M., Ida.	Nov. 20	Dec. 20	0.002
Silver Hill, Nev.	Dec. 23	Jan. 14	0.05
Sonora M. & M., Ida.	Nov. 20	Dec. 14	0.002
Union Con., Nev.	Dec. 22	Jan. 13	0.10
Utah Ideal, Utah	Feb. 1	Feb. 20	0.00½
Winona, Mich.	Dec. 1	Jan. 1	1.00
Yellow Jacket, Nev	Nov. 18	Dec. 22	0.10

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

ABRASIVES—		
Carbons, good drill quality, carat		$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05½@.06
Emery, in kegs; Turkish flour	"	.01½@.02
Grains	"	.03½@.04
Naxos flour	"	.01½@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
Peekskill flour, f.o.b. Easton, Pa	"	.01½@.01¾
Grains, in kegs	"	.02½@.03
Garnet, per quality . sh. ton.		25.00@35.00
Pumice Stone, Am. Powd., 100 lb.		1.60@2.00
Italian, powdered . per lb.		.01½@.01¾
Lump, per quality . .	"	.05@.30
Rottenstone, ground . .	"	.02@.04
Lump, per quality . .	"	.05@.30
Rogue, per quality . . .	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07½@.07¾
ACIDS—		
Acetic 28%	lb.	.02½
Boric	"	.07
Hydrofluoric, 30%	"	.02¾@.03½
" 48%	"	.06
" 52%	"	.06½
" 60%	"	.10
Hydrochloric acid, 20° per 100 lb.		1.15@1.50
Nitric acid, 38° . . . . . per lb.		.04½@.04½
Sulphuric acid, 50°, bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.10
66°, bulk, ton		18.00
Oxalic . . . . . per lb.		.07½@.08
ALCOHOL— Grain 95% . . . . . gal.		2.61
Denatured	"	.42@.44
Refined wood, 95@97% . . .	"	.52@.57
ALUM— Lump . . . . . 100 lb.		$1.75
Ground	"	1.85
Chrome Alum	"	.03¾@.04½
ALUMINUM— Sulphate, com'l. lb.		1.50@1.75
AMMONIA— 24 deg. lb.	"	.04½@.05½
" 26 deg. lb	"	.04¾@.05¾
AMMONIUM—		
Bromide . . . . . lb.		.28
Carbonate	"	.07½@.09½
Muriate grain	"	.05½@.06½
Lump	"	.09½@.09½
Sulphate, 100 lb.	"	2.60@2.65
Sulpho-cyanide com.	"	.30
" " chem. pure . . .	"	.40
ANTIMONY— needle, lump . . lb.		.04@.04½
ARSENIC— white	"	.02¾
Red, Outside brands	"	.06@.07
Saxony	"	.07½@.08
ASPHALTUM—		
Barbadoes . . . . . per ton.		50.00@80.00
West Indies	"	20.00@60.00
Egyptian . . . . . lb.		.11@.16
Gilsonite, Utah ordinary per ton.		32.00@40.00
Trinidad	"	20.00@25.00
California . . . . . per ton.		25.00@30.00
BARIUM—		
Carb. Lump. 80@90% . lg. ton.		30.00@35.00
Precipitated, 96@98%	"	34.00@36.00
Powdered, 80@90% . . . . . lb.		.02@.02½
Chloride com'l . . . . . ton.		35.00@38.00
Nitrate powdered, in casks . . lb.		.05@.06½
Blanc Fixe, dry, bbl . . . . per lb.		.02¾@.03½
BARYTES—		
Am. Ground . . . . . sh. ton.		12.00@15.00
Floated	"	17.00@19.00
Foreign floated	"	20.00@23.00
BLEACHING POWDER—35% 100 lb		1.40@2.00
BLUE VITRIOL— (copper sulphate), carload, per 100 lb.		4.00@4.20
BONE ASH . . . . . lb.		.02½@.04
BORAX, sacks	"	.04½@.05
CALCIUM— Acetate, gray, 100 lb.		1.85@1.92½
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J . . . . . sh. ton.		65.00
Chloride, f.o.b. N. Y . .	"	11.00@14.10
CEMENT—		
Portland, Am. 500 lb . . . . . bbl.		1.50@1.60
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)	"	.65
Slag cement	"	.75@1.25
CHROME ORE—		
New Caledonia 50% ex. ship N. Y . . . . . per lg. ton.		14.00@16.00
Bricks, f.o.b. Pittsburg, per M.		175.00
CLAY, CHINA— Am. common ex-dock, N. Y . . . . . ton.		7.00@10.00
Foreign	"	10.00@20.00
COBALT— Oxide . . . . . lb.		1.10@1.75
COPPERAS— Bulk . . . . . 100 lb.		$0.55
In bbls	"	.65@.80
In bags	"	.60@.75
CRYOLITE (carload) . . . . . lb.		.06@.07
FELDSPAR— Ground . . sh. ton.		12.50@14.00
FIRE BRICK—		
American . . . . . per M.		30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Special extra	"	30.00@35.00
FIRE CLAY— F.o.b. St. Louis.		
St. Louis, extra quality, per ton.		5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump . . . . . lg. ton.		8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock .	"	8.50
FULLER'S EARTH— Lump, 100 lb.		.80@.85
Powdered	"	.80@.85
GRAPHITE— Ceylon.		
Flying dust, finest to best . . . lb.		.02@.04
Dust	"	.02½@.05
Chip	"	.04@.08
Lump	"	.05½@.12
Large lump	"	.08½@.10½
GYPSUM—		
Fertilizer . . . . . sh. ton.		5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best . . . . . lb.		.01¾@.02½
German	"	.02½@.02¾
LEAD— Acetate (sugar of) brown, ... lb.		.07¾@.08
Nitrate, com'l	"	.07¼@.08½
MAGNESITE— Greece.		
Crude (95%) . . . . . lg. ton.		7.50@8.50
Calcined, powdered . . . sh. ton.		26.00@37.00
Brick, domes, per qual. f.o.b. Pittsburg . . . . . M.		160@200
MAGNESIUM—		
Chloride, com'l . . . . . 100 lb.		.90@1.25
Sulphate (Epsom salt) . . 100 lb.		.90@1.00
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide . . . . . lb.		.01@.01½
75@85% binoxide	"	.01½@.01½
85@90% binoxide	"	.01½@.04
90@95% binoxide	"	.06½
Ore, 80%-85% . . . . . sh. ton.		16.00@32.50
MARBLE— Flour . . . . . sh. ton.		8.50@9.00
MINERAL WOOL—		
Slag, ordinary . . . . . sh. ton.		19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal . . . . . lb.		.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.47
Sulphate, single . . . . . lb.		.09@.11
Sulphate, double	"	.06½@.08
NITRATE OF SODA—		
100 lb. 95%		2.07½
95% for 1910		2.07½
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE— best . . . . . lb.		.14@.17
PAINTS AND COLORS—		
Litharge, Am. powdered . . . . lb.		.05½@.06½
English glassmakers'	"	.08½@.09½
Lithopone	"	.03½@.07
Metallic, brown . . . . . sh. ton		16.50@22.00
Red		14.00@18.00
Ocher, Am. common . . .	"	8.50 . . 9.00
Best	"	16.00
Dutch, washed . . . . . lb.		.02½@.03
French, washed	"	.01½@.02
Paris green, pure, bulk	"	.17½@.20½
Red lead, American	"	.06@.06½
Foreign	"	.08½@.09½
Turpentine, spirits bbl., per gal.		.58½@.60
White lead, Am., dry . . . . . lb.		.05¾@.05¾
American, in oil	"	.06½@.07
Foreign, in oil	"	.07½@.09¾
Zinc white, Am. extra dry . .	"	.05½@.05¾
French, proc's, red seal, dry	"	.06¾@.07½
French, process, green seal, dry	"	.07½@.10½
PHOSPHATES— Acid . . . . . 55@60c. per unit		
*Fla., hard rock 77%		6.50@9.00
land pebble 68%		3.75@4.00
†Tenn., 78@80%		5.00@5.60
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@4.00

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal . . . . . lb.		$.07½
Powdered or granulated . .	"	.08
Bichromate, Am	"	.07½@.08
Scotch	"	.10½
Bromide	"	.20
Carbonate (80@85%)	"	.03¾@.04
Caustic, ordinary	"	.06½@.06¾
Elect. (90% KOH)	"	.06
Chloride (muriate), 100 lb . .		1.90
Chlorate, powdered	"	.09½@.09¾
Crystals	"	.09@.09½
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.20@.22½
Kainite, long ton, bulk, 8.50; bags,		9.50
Permanganate . . . . . lb.		.09½@.10½
Prussiate, yellow	"	.13@.13½
Red	"	.30@.33
Sulphate (basis 90%) . . . 100 lb.		2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size, f.o.b. mines . . . . per unit.		11@11½c.
Domestic, non-arsenical, fines, per unit, f.o.b. mines		10@10½c.
Imported, non-arsenical, furnace size, ex-ship, per unit		.12@.12½
Imported, arsenical, furnace size, ex-ship, per unit		.11½@.12
Imported fines, arsenical, ex-ship, per unit		.09
Imported fines, non-arsenical, ex-ship, per unit		10½@11c.

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore for furnace is delivered in large lumps.

SALT— N. Y. com. fine 280 lb. bbl.		.72@1.13
N. Y. agricultural . . . . . sh. ton.		3.80@4.50
SALTPETER— Crude . . 100 lb.		4.00@4.50
Refined, crystals	"	5.50@7.00
SILICA—		
Ground quartz, ord'ry . . lg. ton.		10.00@15.00
Silex, ground	"	13.00@15.00
Silex, floated	"	35.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER— Nitrate, crystals . . . oz.		.33½@.36¾*
SODIUM— Acetate . . . . . lb		.04½@.05
"Alkali," per 100 lb., 58/48 . . .		.80@.87½
Bicarb. soda, per 100 lb		1.00@1.30
Soda, caustic, per 100 lb., 78/60		1.80@2.00
Soda, caustic, powdered		.02½@.03
Salt cake, per 100 lb., bulk		.40 up
Salt cake, bbl		.65@.85
Soda, monohydrate, per lb		1.40@1.75
Bichromate . . . . . lb.		.05½@.06½
Bromide	"	.20
Chlorate, com'l	"	.08½@.09½
Cyanide, 120-130% KCN, per 100%		
Carloads (30,000 lb.) . . . . . lb.		18c.
5-ton lots	"	18½c.
Less than 5 tons	"	19c.
Hyposulphite, Am	"	1.30@1.50
Phosphate . . . . . 100 lb.		2.20@2.50
Prussiate	"	.08½@.09
Sal soda, f.o.b. N. Y . . .	"	.65@.75
Foreign, f.o.b. N. Y . .	"	.80@1.00
Silicate, com'l	"	.65@1.00
Sulphate, com'l (Glauber's salt) . . . . . 100 lb.		.60@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM— Nitrate . . . . . lb.		.07½@.08
SULPHUR— Louisiana (prime) to New York . . . . . lg. ton.		22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll . . . . . 100 lb.		1.85@2.15
Flour	"	2.00@2.40
Flowers, sublimed . . .	"	2.20@2.60
Sicilian, extra qual., unmixed seconds, crude brimstone to New York . . . . . lg. ton.		$22.00
Other ports	"	22.50
TERRA ALBA— Fr. & Eng. 100 lb.		.80@1.00
TALC— Domestic . . . . . sh. ton.		15.00@20.00
French	"	18.00@25.00
Italian, best	"	30.00@40.00
TIN— Bi-chloride, 50% . . . . . lb.		.09½
Crystals	"	.21½@.22½
Oxide, lb	"	.35@.40
URANIUM— Oxide	"	3.50@4.25
ZINC— Chloride sol., com. 20°	"	.02½
Chloride, granular	"	.04½
Dust	"	.06½
Sulphate	"	.02½@.02¾

NOTE—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output as mattesr of private contract.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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AMMONIA AND AMMONIUM SULPHATE.

11032—AMMONIA — The Development of the Ammonia Industry in Gas Works During the Last Fifty Years. H. W. Hilgenstock. (Chem. Engr., Sept., 1909; 7 pp., illustrated.) 40c.

11033—AMMONIA RECOVERY at Gas Works. J. S. Unger. (Gas Engrs.' Mag., Sept. 15, 1909; 2 pp.) 40c.

11034—SULPHATE OF AMMONIA—Experiences with a Small Sulphate of Soda Plant. H. W. Saville. (Gas Engrs.' Mag., Sept. 15, 1909; 1½ pp., illustrated.) 20c.

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11036—QUEBEC—The Asbestos Industry of Quebec, Canada. Alexander Gray. (Min. Journ., Nov. 6, 1909; 1¾ pp.) 40c.

11037—WYOMING ASBESTOS DEPOSITS and Mills. Arthur Lakes. (Min. Sci., Oct. 28, 1909; 2⅓ pp., illustrated.) 20c.

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COAL AND COKE.

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